

NUREG-0383
Volume 2
Revision 7

Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

**U.S. Nuclear Regulatory
Commission**

Office of Nuclear Material Safety and Safeguards



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Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

Manuscript Completed: September 1984
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Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555



FOREWORD

This directory contains a Summary Report of the U.S. Nuclear Regulatory Commission's Approved Packages (Volume 1), all Certificates of Compliance (Volume 2), and Summary Report of NRC Approved Quality Assurance Programs (Volume 3) for Radioactive Material Packages effective September 30, 1984.

The purpose of this directory is to make available a convenient source of information on packagings which have been approved by the U.S. Nuclear Regulatory Commission. To assist in identifying packaging, an index by Model Number and corresponding Certificate of Compliance Number is included at the back of Volumes 1 and 2 of the directory. A listing by packaging types is included in the back of Volume 2. An alphabetical listing by Company name is included in the back of Volume 3 for approved QA programs. The Summary Reports include a listing of all users of each package design and approved QA programs prior to the publication date of the directory.

Shipments of radioactive material utilizing these packages must be in accordance with the provisions of 49 CFR §173.471 and 10 CFR Part 71, as applicable. In satisfying the requirements of Section 71.12, it is the responsibility of the licensees to insure themselves that they have a copy of the current approval and conduct their transportation activities in accordance with a Nuclear Regulatory Commission approved quality assurance program. Copies of the current approval may be obtained from the U.S. Nuclear Regulatory Commission Public Document Room files (see Docket No. listed on each certificate) at 1717 H Street, Washington, DC 20555. Note that the general license of 10 CFR §71.12 does not authorize the receipt, possession, use or transfer of byproduct, source or special nuclear material; such authorization must be obtained pursuant to 10 CFR Parts 30 to 36, 40, or 70.

Please note that not all packages have been generally licensed in accordance with 10 CFR §71.12(d). If a person desires to use a package which is not generally licensed, please contact the Transportation Certification Branch, U.S. Nuclear Regulatory Commission, concerning steps that must be taken to obtain a general license for the package.

Comments which would make future revisions of this Directory more useful are invited and should be directed to the Transportation Certification Branch, U.S. Nuclear Regulatory Commission.

Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

**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
0361	2	USA/0361/B(U)F	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Nuclear Regulatory Commission
Washington, DC 20555

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUREG-0361; Safety Analysis Report for the Plutonium
Air Transportable Package Model No. PAT-1

c. DOCKET NUMBER

71-0361

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.: PAT-1
- (2) Description

A stainless steel containment vessel (designated TB-1) surrounded by a stainless steel and redwood overpack (designated AQ-1). The contents are sealed within a stainless steel product can (designated PC-1) inside the containment vessel.

The AQ-1 overpack is a right circular cylinder, approximately 42-1/2 inches long by 24-1/2 inches outside diameter. The walls of the overpack consist of approximately 8 inches of grain oriented redwood encased within double stainless steel drums. The ends of the drums are doubly closed. A copper heat conducting element and an aluminum load distributor are encased within the redwood.

The TB-1 containment vessel is approximately 8-1/2 inches outside length by 6-3/8 inches outside diameter. The minimum wall thickness of the vessel is approximately 1/8 inch. The interior cavity of the vessel is a right circular cylinder, 4-3/4 inches diameter, with hemispherical ends. The vessel is closed by 1-1/2-inch diameter bolts and doubly sealed with a copper gasket and knife edges and an elastomer O-ring.

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5. (a) Packaging (continued)

(2) Description (continued)

The weight of the package is approximately 500 pounds. The weight of the TB-1 containment vessel, when loaded with 4.4 pounds of contents is approximately 41.7 pounds.

(3) Drawings and Specifications

The Model No. PAT-1 packaging is fabricated in accordance with the drawings and specifications in Section 9.0 of the Safety Analysis Report, NUREG-0361.

(b) Contents

(1) Type and form of material

Plutonium oxide and its daughter products, in any solid form. The plutonium oxide may be mixed with uranium oxide and its daughter products, in any solid form.

(2) Maximum quantity of material per package and additional permissible contents

(i) Maximum 2.0 kg total radioactive material, plus: maximum 16 grams of water and 10 grams of polyethylene or polyvinylchloride bagging material. The maximum decay heat load of the contents may not exceed 25 watts.

(ii) Maximum 200 grams total radioactive material, plus: maximum one gram of water, maximum 200 grams of metal canning material (in addition to the PC-1 product can, Drawing No. 1024), maximum 64 grams of aluminum foil or honeycomb (in addition to the top spacer, Drawing No. 1015), maximum 175 grams of glass and maximum 35 grams polyethylene or polyvinylchloride bagging material. The maximum decay heat load of the contents may not exceed 25 watts.

(c) Fissile Class:

6. The PC-1 product can (Drawing No. 1024) and the top spacer (Drawing No. 1015) need not be used when the contents include 20 curies or less of plutonium.
7. Prior to first use, each packaging shall meet the acceptance tests and standards specified in Subsection 8.1 and Section 9.0 of the Safety Analysis Report.
8. Prior to each shipment, the package shall meet the tests and criteria specified in Subsection 8.2 of the Safety Analysis Report.
9. The package shall be prepared for shipment and operated in accordance with the procedures specified in Section 7.0 of the Safety Analysis Report.

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10. The systems and components of each packaging shall meet the periodic tests and criteria specified in Subsection 8.3 of the Safety Analysis Report.
11. Repair and maintenance of the packaging shall be in accordance with Sections 8.0 and 9.0 of the Safety Analysis Report.
12. The packaging shall be designed, procured, fabricated, accepted, operated, maintained, and repaired in accordance with a quality assurance plan approved by the Nuclear Regulatory Commission for this purpose.
13. Through special arrangement with the carrier, the shipper shall ensure observance of the following operational controls for each shipment of plutonium by air:
 - (a) The package(s) must be stowed aboard aircraft on the main deck in the aft-most location that is possible for cargo of its size and weight. No other type cargo may be stowed aft of the package(s).
 - (b) The package(s) must be securely cradled and tied-down to the main deck of the aircraft. The tie-down system must be capable of providing package restraint against the following inertia forces acting separately relative to the deck of the aircraft: Upward, 2g; Forward, 9g; Sideward, 1.5g; Downward, 4.5g.
 - (c) Cargo which bears one of the following hazardous material labels may not be transported aboard an aircraft carrying a package(s):

Explosive A	Non-Flammable Gas
Explosive B	Flammable Liquid
Explosive C	Flammable Solid
Spontaneously Combustible	Flammable Gas
Dangerous When Wet	Oxidizer
Organic Peroxide	Corrosive

This restriction does not apply to hazardous material cargo labeled solely as:

Radioactive I	Poison
Radioactive II	Poison Gas
Radioactive III	Irritant
Magnetized Materials	Etologic Agent

14. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.
15. The package authorized by this certificate is hereby approved for transportation of plutonium by air.
16. Expiration date: August 31, 1988.

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REFERENCES

Safety Analysis Report for the Plutonium Air Transportable Package Model Number PAT-1, NUREG-0361, June 1978.

Sandia Laboratories application dated February 20, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER 4888	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/4888/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address): Teledyne Energy Systems 110 West Timonium Road Timonium, MD 21093	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Martin Company application dated August 13, 1965, as supplemented.
c. DOCKET NUMBER 71-4888	

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 Nos.: Sentinel-25A, LCG-25A; Sentinel-25B, LCG-25B; Sentinel-25C, LCG-25C; Sentinel-25C3, -25D, -25E, and -25F

(2) Description

The packages are thermoelectric generators. The major components include the main housing, tungsten shield, housing flange, and electrical connectors. The approximate dimensions and weights for the various Model Nos. are as follows:

Model No.	Dimensions (inches)	Weight (lbs.)
Sentinel-25A, LCG-25A	29 OD x 25	3000
Sentinel-25B, LCG-25B	25 OD x 25	3300
Sentinel-25C, LCG-25C	24 OD x 32	2000
Sentinel-25C3	24 OD x 32	1300
Sentinel-25D	25 OD x 27	3300
Sentinel-25E	25 OD x 34	4200
Sentinel-25F	24 OD x 32	1400

(3) Drawings

The packagings are constructed in accordance with the following Drawing Nos:



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5. (a) Packaging (continued)

(3) Drawing Nos.

<u>Model No.</u>	<u>Drawing Nos.</u>
All Models	Isotopes, Inc. Drawing Nos.: 001-20000 001-20001 001-20002 001-20003
Sentinel-25A, LCG-25A	Martin Company Drawing Nos.: N0013100 N0013108 N0013113 PN1000003
Sentinel-25B, LCG-25B	Martin Company Drawing Nos.: N0013200 N0013208
Sentinel-25C, LCG-25C Sentinel-25C3	Isotopes, Inc. Drawing Nos.: 001-C10000 001-70012 001-40019
Sentinel-25D Sentinel-25E Sentinel-25F	Isotopes, Inc. Drawing Nos.: 001E10000 001D10000 001F10000 001-70033 001-70024 001-40006 001-40015 001-40017

(b) Contents

(1) Type and form of material

- (i) Strontium 90 titanate doubly encapsulated in a Hastelloy or Uniloy fuel capsule which meet the requirements of special form radioactive material; or
- (ii) Model No. Sentinel-25F may have, strontium fluoride doubly encapsulated in a Hastelloy or Uniloy fuel capsule, with a Hastelloy C-276 liner which meets the requirements of special form radioactive material.

(2) The maximum quantity of material per package

125,000 curies

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6. Eye-bolt shall be removed or covered during transportation to prevent their use as tie-down devices of packages.
7. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: July 31, 1985.

REFERENCES

Isotopes, Inc. applications dated: September 15 and 16, 1969; and March 3 and April 20, 1970.

Martin Company application dated October 28, 1965; with supplements dated: January 14, April 1, and July 21, 1966.

Martin Company application dated March 21, 1967.

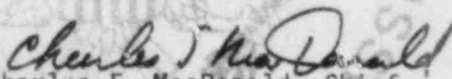
Martin Company application dated August 16, 1967; with supplements dated: September 1, and September 15, 1967.

Isotopes, Inc. application dated September 10, 1969; with supplement dated: October 30, 1969.

Isotopes, Inc. application dated December 16, 1968; with supplements dated: December 26, 1968; and January 10, 1969.

Isotopes, Inc. application dated March 27, 1970; with supplement TES-MIH-1403 dated: January 25, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1 a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
4909	5	USA/4909/AF	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
General Electric Company
P.O. Box 780
Wilmington, NC 28401
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
General Electric Company application dated
November 19, 1982, as supplemented.

c. DOCKET NUMBER 71-4909

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 Nos.: GE-21PF-1 and W-21PF-1

(2) Description

Packaging as described and constructed in accordance with DOT Specification 21PF-1 except as shown in General Electric Company Drawing No. 769E237 (GE-21PF-1) - Sheet Nos. 1 and 2, Rev. 3; or Westinghouse Electric Corporation Drawing No. 360F05EQ01 (W-21PF-1) - Sheet No. 1, Rev. 8; Sheet No. 2, Rev. 8; and Sheet No. 3, Rev. 8. Maximum gross weight of the package is 8,600 pounds.

(b) Contents

(1) Type and form of material

Uranium hexafluoride

(2) Maximum quantity of material per package and fissile class

In accordance with DOT Specification 21PF-1

6. Prior to each shipment, the overpack gaskets must be inspected. These gaskets must be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

7. The following conditions apply to the Model No. GE-21PF-1 packaging:

(i) For packagings which are not seal welded, the joints between the inner and outer shells (ends) and the side (end) panel moldings must be silicone sealed. The inner and outer overpack gaskets must cover side (end) panel molding joints (unless seal welded). Except for joints covered by a glued down gasket, visually inspect all silicone sealed joints and maintain in good repair prior to each shipment or outside storage (loaded or empty).

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(ii) Prior to June 30, 1985, all body seams and joints for the inner and outer shells (ends) and the side (end) panel moldings must be continuous welds. Welding must be by a fusion process in accordance with the American Welding Society Code or American Society of Mechanical Engineers' Code.

8. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: November 30, 1987.

REFERENCES

General Electric Company application dated November 19, 1982.

Supplements dated: September 23, 1983; and February 15 and May 22, 1984.

Westinghouse Electric Corporation supplements dated: July 20 and November 21, 1933.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Olegarden
for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, MSS

Date: JUN 19 1984

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
4949	4	USA/4949/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

United Nuclear Corporation
Recovery Operations
Wood River Junction, RI 02894

United Nuclear Corporation application dated
October 4, 1979, as supplemented.

c. DOCKET NUMBER

71-4949

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.: UNC-1484
- (2) Description

Containment vessel consists of a 5-1/4" ID x 36-1/2" long and 3/8" thick steel pipe with welded bottom plate and bolted top flange closure. Containment vessel is centered and supported within a 65 gallon minimum 16-gage steel drum with DOT Specification 17H closure by plywood spacers, benelox, tubular steel spokes, and insulation material.

(3) Drawings

Container is constructed in accordance with United Nuclear Corporation Drawing No. D-5005-8017, Rev. 1.

(b) Contents

(1) Type and form of material

Uranium oxide and compounds which will withstand a temperature of 750° without pressure generating decomposition. Density may not exceed 5.3 g U/cc. The theoretical-density-moderator relationship for "U compounds" shown in Figure 309 XXIV, dated February 6, 1970, Docket No. 70-36, or in Figure 1.D.17 of the UK Handbook may not be exceeded. Uranium may be enriched to any degree in the U-235 isotope. The maximum H/X atomic ratio considering all sources of hydrogenous material interspersed with the fissile material shall not exceed 0.5.

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5. (b) Contents

(2) Maximum quantity of material per package

Total contents not to exceed 65 pounds with the U-235 content not to exceed 25.4 kg.

(c) Fissile Class

II and III

(1) Minimum transport index to be shown on label for Class II

2.0

(2) Maximum number of packages per shipment for Class III

50

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

7. Expiration date: December 31, 1984.

REFERENCES

United Nuclear Corporation application dated October 4, 1979.

Supplement dated: November 14, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 4986	b. REVISION NUMBER 16	c. PACKAGE IDENTIFICATION NUMBER USA/4986/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): General Electric Company P.O. Box 780 Wilmington, NC 28401	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: General Electric Company application dated March 1, 1982, as supplemented. 71-4986
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c. DOCKET NUMBER

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 Nos.: RA-2 and RA-3

(2) Description

A fuel assembly and fuel rod shipping container. Packagings are right rectangular boxes consisting of an outer container of wooden construction and a metal inner container separated by cushioning material.

The metal inner container is 11-1/2 inches by 18 inches by 179 inches long and is positioned within a Model No. RA-3 wooden outer container approximately 30 inches by 31 inches by 207 inches long. Cushioning is provided between the inner and outer containers by phenolic impregnated honeycomb and ethafoam, or equivalent. Closure is accomplished by bolts, latches, or equivalent. A pressure relief (breather) valve is provided on the inner container, and is set for 0.5 psi differential. The total weight of the packaging and contents is 2,800 pounds.

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5. (a) Packaging (continued)

(3) Drawings

- (i) The packagings are constructed in accordance with the following GE Drawing Nos.:

769E229, Revision 1, Model RA-3 Wooden Outer Container
769E231, Revision 3, Model RA-3 Inner Container
769E232, Revision 3, Model RA-2 Inner Container

The RA-3 inner container may be constructed in accordance with Exxon Nuclear Company, Inc. Drawing No. XN-NF-304,416, Rev. 2; or Westinghouse Electric Corporation Drawing No. 1685E66, Rev. 1.

(4) Product Container

Five-inch, Schedule 40, stainless steel, pipe fitted with screw type or flange closure. Container shall be vented in the event it contains materials which decompose at less than 1475°F.

(b) Contents

(1) Type and form of material

- (i) UO_2 fuel assemblies with a maximum average U-235 enrichment of 3.3% by weight. Assembly rods are clad with a minimum 0.029-inch thickness of zircaloy and a maximum fuel pellet outside diameter of 0.416 inch. Each assembly, made up of a maximum 8 x 8 square array of fuel rods, must have a maximum fuel length of 174 inches with a maximum fuel cross-sectional area of 25 square inches.
- (ii) UO_2 fuel assemblies with a maximum average U-235 enrichment of 2.7% by weight. Assembly rods are clad with a minimum 0.032-inch thickness of zircaloy and a maximum fuel pellet outside diameter of 0.490 inch. Each assembly, made up of a maximum 7 x 7 square array of fuel rods, must have a maximum fuel length of 174 inches with a maximum cross-sectional area of 25 square inches.

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5. (b) Contents (continued)

(1) Type and form of material (continued)

- (iii) UO_2 fuel rods with a maximum U-235 enrichment of 5.0% by weight. Rods are clad with zircaloy, incaloy, inconel, or stainless steel such that the ratio of clad to fuel cross sectional area be at least 0.26, and a maximum fuel pellet outside diameter of 0.508 inch. Each rod must have a maximum length of 174 inches. The clad rods must be bundled (contained) in the product container described in 5(a)(4).
- (iv) UO_2 fuel rods with a maximum U-235 enrichment of 6.5% by weight. Rods are clad with zircaloy, incaloy, inconel or stainless steel such that the ratio of clad to fuel cross sectional area be at least 0.26, and a maximum fuel pellet outside diameter of 0.508 inch. Each rod must have a maximum length of 174 inches. The clad rods must be bundled (contained) in the product container described in 5(a)(4).
- (v) UO_2 fuel assemblies with a maximum average U-235 enrichment of 3.3% by weight for assembly rods clad with a minimum 0.030-inch thickness of zircaloy and a maximum fuel pellet outside diameter of 0.356 inch. Each assembly to be made up of a 9x9 square array of fuel rods with a maximum fuel length of 174 inches and a maximum fuel cross-sectional area of 26 square inches.

(2) Maximum quantity of material per package

- (i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(v):
Two (2) fuel assemblies.*
- (ii) For the contents described in 5(b)(1)(iii) and 5(b)(1)(iv):
Two (2) fuel bundles.*

(A bundle is defined as an arrangement of rods which are either contained within a product container or strapped together.)

*Two short fuel assemblies or bundles may be substituted for a full length fuel assembly or bundle provided the individual assemblies (or bundles) are shipped end-to-end and the total length does not exceed 174 inches.

(c) Fissile Class

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Page 4 - Certificate No. 4986 - Revision No. 16 - Docket No. 71-4986

6. Each fuel assembly must be unsheathed or must be enclosed in an unsealed, polyethylene sheath which may not extend beyond the ends of the fuel assembly. The ends of the sheath may not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

Polyethylene shipping shims may be inserted between rods within the fuel assemblies up to a maximum of 0.20 g H₂O equivalent per cubic centimeter averaged over the assembly.

7. In lieu of the product container specified in 5(a)(4), except for UO₂ fuel rods with U-235 enrichment greater than 3.2% and for rods described in 5(b)(1)(v), the clad rods must be bundled (bound with steel strappings at two or more locations) with a maximum cross sectional area of 20.0 square inches. The total breaking strength of the strapping must be 30 times the weight of the bound rods.
8. The maximum spacing between adjacent rods within the bundle must be 0.012 inch. The spacing must be maintained by the product container wall, metal strappings or peripheral metallic dunnage with a melting point greater than 1475°F within the bundle.
9. The package authorized by this certificate is hereby authorized for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: March 31, 1987.

REFERENCES

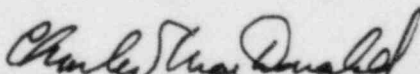
General Electric Company application dated March 1, 1982.

Supplement dated: March 15, 1982.

Fxxon Nuclear Company supplements dated: June 24, 1981; and January 11 and February 9, 1982.

Westinghouse Electric Company supplements dated: February 4, 1983; and March 27, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 24 1984

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5026	12	USA/5026/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc.
application dated November 19, 1979,
as supplemented.

c. DOCKET NUMBER

71-5026

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.: CNS 14-190
- (2) Description

The packaging is a steel-encased, concrete shielded shipping cask. The cask is 94-1/4 inches in diameter by 103-3/4 inches in length. Reinforced concrete occupies the 7-inch annular space between the shells and the two base plates. The lid is a 4-3/4 inches thick laminated steel cover held in place by 32, high strength 1-1/4-inch diameter bolts. A silicone O-ring is used to seal the joint between the lid and the cask body. The outer shell and base plate are 1/4-inch thick, while inner shell and base plate are 2 inches thick. The cask is reinforced at the top and bottom with steel rings and is equipped with lifting lugs. The lid is provided with two access ports. Gross weight is about 71,000 pounds.

(3) Drawings

The package is constructed in accordance with the following ATCOR, Inc. Drawing Nos.: 1000-D-0049; 0146-B-0004, Rev. E; 0146-B-0009; 0146-D-0025, Rev. A; 0146-D-0020-1, Rev. A; and 0146-C-0018, Rev. E.

(b) Contents

- (1) Type and form of material
 - (i) Byproduct material in the form of dewatered resins, solids, or solidified waste contained within secondary container(s).
 - (ii) Radioactive material in the form of activated reactor components packaged in secondary container(s).

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5. (b) Contents (continued)

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material, not to exceed 20 thermal watts and 23,000 pounds including weight of the contents, secondary container(s) and shoring. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

6. The dose rate from the loaded cask shall not exceed 10 mrem/hr at six feet from the surface of the cask.
7. The access plugs shall be appropriately plugged and sealed prior to transport.
8. Shoring shall be placed between the secondary container(s) and the cask cavity to prevent movement during accident conditions of transport.

9. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
10. Prior to each shipment, the packaging lid silicone O-ring shall be inspected. The O-ring shall be replaced with a new silicone O-ring if inspection shows any defects or every six (6) months, whichever occurs first.
11. Packages fabricated after July 31, 1983, shall be constructed of A-516, Grade 70 carbon steel instead of A-36 and A-516, Grade 60 carbon steels.
12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
13. Expiration date: January 31, 1985.

Page 3 - Certificate No. 5026 - Revision No. 12 - Docket No. 71-5026

REFERENCES

Chem-Nuclear Systems, Inc. application dated November 19, 1979.

Supplements dated: April 14 and June 17, 1983; and January 18, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 0 5 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 5059	b. REVISION NUMBER 9	c. PACKAGE IDENTIFICATION NUMBER USA/5059/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Fuel Services, Inc.
2000 218
Cincinnati, OH 45218

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Fuel Services, Inc. application
dated March 27, 1981.

c. DOCKET NUMBER 71-5059

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.: NFS Uranyl Nitrate Tank Trailer

(2) Description

Bulk liquid insulated cargo tank trailer. The 3,800 gallon tank trailer is of all welded construction of type 304L stainless steel.

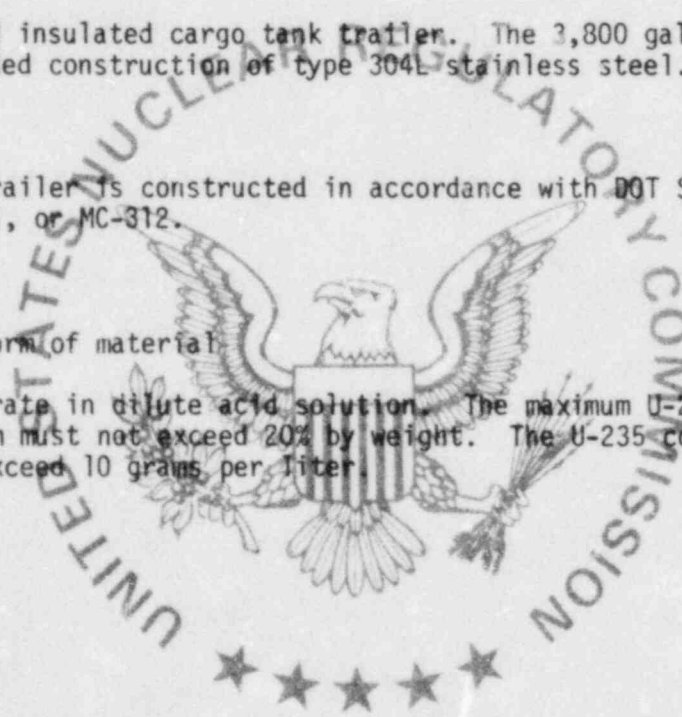
(3) Drawing

The tank trailer is constructed in accordance with DOT Specifications MC-310, MC-311, or MC-312.

(b) Contents

(1) Type and form of material

Uranyl nitrate in dilute acid solution. The maximum U-235 enrichment in the uranium must not exceed 20% by weight. The U-235 content of the solution must not exceed 10 grams per liter.



Page 2 - Certificate No. 5059 Revision No. 9 - Docket No. 71-5059

5. (b) Contents (continued)

(1) Type and form of material (continued)

The total uranium content must not exceed 357 grams per liter (1.5M). The $UO_2(NO_3)_2 \cdot 6H_2O$ content must not exceed 50 weight percent. The HNO_3 concentration will be normally 0.4M. The freezing temperature of any of the solutions must be less than 32°F.

(2) Maximum quantity of material per package

Not more than 45,600 pounds net weight of uranyl nitrate acid solution.

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

- 6. The solution must be at a temperature of 68°F or above at the time of packaging.
- 7. Prior to delivery to a carrier for transport, for U-235 enrichments greater than 4% by weight the shipper must ensure that at no point along the proposed shipping route that the ambient temperature will be less than 32°F. In the event freezing weather is encountered the administrative procedures and controls as specified in Nuclear Fuel Services, Inc. application dated March 27, 1981, must be complied with for all U-235 enrichments.
- 8. The package must be tested and maintained in accordance with Section 8.0 of the Application.
- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: September 30, 1986.

REFERENCE

Nuclear Fuel Services, Inc. application dated March 27, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, MMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5071	3	USA/5071/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Department of the Navy
Naval Support Force Antarctica
FPO San Francisco, CA 96601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Aerojet General Corporation application
dated May 29, 1968, as supplemented.

c. DOCKET NUMBER

71-5071

4. CONDITIONS

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

5.

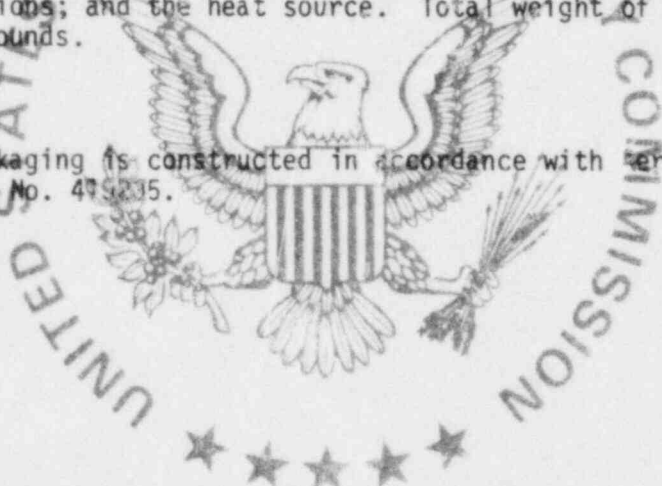
(a) Packaging

- (1) Model No.: URIPS-P-1
- (2) Description

A thermoelectric generator 13.7 inches in diameter by 19.7 inches long packaged in a rectangular wooden box having overall dimensions of 28.5 inches by 28.5 inches by 35.5 inches with 4-inch thick wooden walls. Major components of the generator consist of an outer stainless steel main housing, flange, and end cup; lead shielding; stainless steel pressure vessel; Min-k insulation; shield plug; electrical connections; and the heat source. Total weight of the package is 1,425 pounds.

(3) Drawing

The packaging is constructed in accordance with Aerojet-General Corporation Drawing No. 47535.



Page 2 - Certificate No. 5071 - Revision No. 3 - Docket No. 71-5071

5. (b) Contents

(1) Type and form of material

Strontium 90 titanate pellets doubly encapsulated by a thin inner liner and a 0.2-inch thick Hastelloy C primary containment capsule which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

7,200 ci

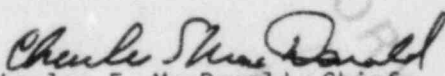
6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: July 31, 1985.

REFERENCES

Aerojet-General Corporation application dated May 29, 1968.

Supplements dated: July 6 and 22 and September 17 and 23, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5086	3	USA/5086/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

United Nuclear Corporation
67 Sandy Desert Rd.
Uncasville, CT 06382

United Nuclear Corporation application dated
April 22, 1980, as supplemented.

c. DOCKET NUMBER 71-5086

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

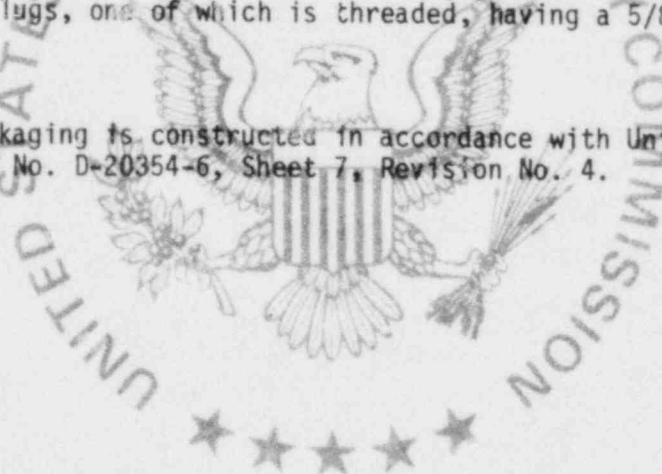
(1) Model No.: UNC-2600

(2) Description

The inner container is an 11-gage steel box 96" long with a 25 square inch maximum cross section. The inner container is supported in a 22-1/2" ID by 102" long 14-gage steel drum by an insertable cage formed by nine, 21-1/2" diameter by 3/8" thick steel plates spaced approximately 12" apart, with a channel formed through the center of the plates by angle iron. The outer container closure is made with a 14-gage or heavier drum lid with 12-gage bolt locking ring with drop forged lugs, one of which is threaded, having a 5/8" diameter bolt.

(3) Drawing

The packaging is constructed in accordance with United Nuclear Corporation Drawing No. D-20354-6, Sheet 7, Revision No. 4.



Page 2 - Certificate No. 5086 - Revision No. 3 - Docket No. 71-5086

5. (b) Contents

(1) Type and form of material

- (i) Dry uranium-zirconium, uranium-aluminum alloys and compounds with densities not exceeding 1 kg U-235 per liter in the form of plates or sheets. Uranium may be enriched to any degree in the U-235 isotope.
- (ii) Dry uranium oxide pellets encapsulated in stainless steel, aluminum or zircaloy rods. Uranium may be enriched to a maximum 5.0 w/o in the U-235 isotope.

(2) Maximum quantity of material per package

Ten (10) kilograms U-235 and the net weight of the contents not to exceed 308 pounds.

(c) Fissile Class

II and III

(1) Minimum transport index to be shown on label for Class II

10.0

(2) Maximum number of packages per shipment for Class III

Ten (10)

- 6. The cross section of the inner container shall be limited to a maximum 19.6 square inches for the contents specified in 5(b)(1)(i) where the ratio of the weight of U-235 to the weight of U-235 plus zirconium exceeds 0.074 or the ratio of the weight of U-235 to the weight of U-235 plus aluminum exceeds 0.22.
- 7. Optional banding of wooden blocks to outside of container is not authorized.
- 8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 9. Expiration date: May 31, 1985.

REFERENCES

United Nuclear Corporation application dated April 22, 1980.

Supplement dated: May 8, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
5088	3	USA/5088/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Rockwell International
8900 DeSoto Avenue
Canoga Park, CA 91304

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Rockwell International application dated
September 8, 1980, as supplemented.

c. DOCKET NUMBER

71-5088

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 Nos.: D34710-1 and D34710-2
- (2) Description

Containment vessel is a 22.50-inch ID Schedule 20 steel pipe, 40 to 41 inches long for the Model No. D34710-1 and 50 to 51 inches long for the Model No. D34710-2, with 5/16-inch thick welded end plate, and bolted flange closure with leak tight gasket. Inner container is centered and supported in a 22.5-inch diameter steel drum with minimum thickness of 18-gage. Void spaces between inner and outer container are filled with vermiculite. Gross weight of the package is 420 lbs for the Model No. D34710-1 and 480 lbs for the Model No. D34710-2.

(3) Drawings

The Model No. D34710-1 packaging is constructed in accordance with the following National Lead Company Drawing Nos.:

D34710 Sheet 1 of 2, Issue 5
D34710 Sheet 2 of 2, Issue 2

Page 2 - Certificate No. 5088 - Revision No. 3 - Docket No. 71-5088

(3) Drawings (continued)

C34711, Issue 3
C34712, Issue 4
C34713, Issue 1

The Model No. D34710-2 packaging is constructed in accordance with the following National Lead Company Drawing Nos.:

034710 Sheet 1 of 2, Issue 6
C34799, Issue 1
C34712, Issue 4
C34713, Issue 1
D35846T-1, Issue 2, as amended by letter dated February 8, 1978.

(b) Contents

For the Model No. D34710-1 packaging:

(1) Type and form of material

Uranium metal or alloy plate type unirradiated fuel elements with a minimum active fuel length of 23 inches. Uranium may be enriched to 93.5 w/o in the U-235 isotope.

(2) Maximum quantity of material per package

2.025 kilograms U-235.

For the Model No. D34710-2 packaging:

(1) Type and form of material

MTR-type fuel elements.

(2) Maximum quantity of material

860 grams U-235.

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(c) Fissile Class

For the Model No. D34710-1 packaging:

Fissile Class	II	
Minimum transport index to be shown on label	<u>Max kilograms U-235 per container</u>	<u>Transport Index</u>
	2.025	1.2
	1.700	1.0
	1.400	0.9
	1.100	0.8
	0.800	0.7
	0.500	0.5

For the Model No. D34710-2 packaging:

Fissile Class	II	
Minimum transport index to be shown on label	<u>Max grams U-235 per container</u>	<u>Transport Index</u>
	860	0.7
	500	0.5

6. For the Model No. D34710-1 packaging:

The H/X atomic ratio considering all hydrogenous material between fuel elements within the inner container and the weight of the uranium shall not exceed:

<u>Max kilograms U-235 per container</u>	<u>Maximum H/X</u>
2.025	2.2
1.700	2.6
1.400	3.2
1.100	4.1
0.800	5.6
0.500	8.9
0.350	10.4
0.290	13.0

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6. (Continued)

For the Model No. D34710-2 packaging:

The H/X atomic ratio considering all hydrogenous material between fuel elements within the inner container and the weight of the uranium shall not exceed:

<u>Max grams U-235 per container</u>	<u>Maximum H/X</u>
860	6.1
800	6.5
700	7.5
600	8.7
500	10.4
400	13.0

7. The packages authorized by this certificate is hereby approved for use under the general license provision of 10 CFR §71.12.

8. Expiration date: October 31, 1985.

REFERENCES

Rockwell International application dated September 8, 1980.

University of Missouri letter (Gooden to Ladd) dated July 30, 1968; Idaho Nuclear Corporation letter (Fox to Tingey) dated April 30, 1968; and Oak Ridge National Laboratory, Neutron, Physics Annual Progress Report period ending September 1, 1958, pp 34-36.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER 5149	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/5149/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Babcock & Wilcox Company
P.O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company application
dated September 20, 1979.

c. DOCKET NUMBER

71-5149

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.: 814A

(2) Description

Steel container as described in Babcock & Wilcox Company's application dated September 20, 1979.

(b) Contents

(1) Type and form of material

Unirradiated fuel cluster

(2) Maximum quantity of material per package

One fuel cluster containing U-235 with inserted poison fixture as specified in Babcock & Wilcox Company's application dated September 20, 1979.

(c) Fissile Class

III

Maximum number of packages per shipment or
per railroad car

Five (5)

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

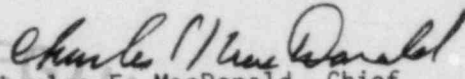
7. Expiration date: October 31, 1989.

Page 2 - Certificate No. 5149 - Revision No. 5 - Docket No. 71-5149

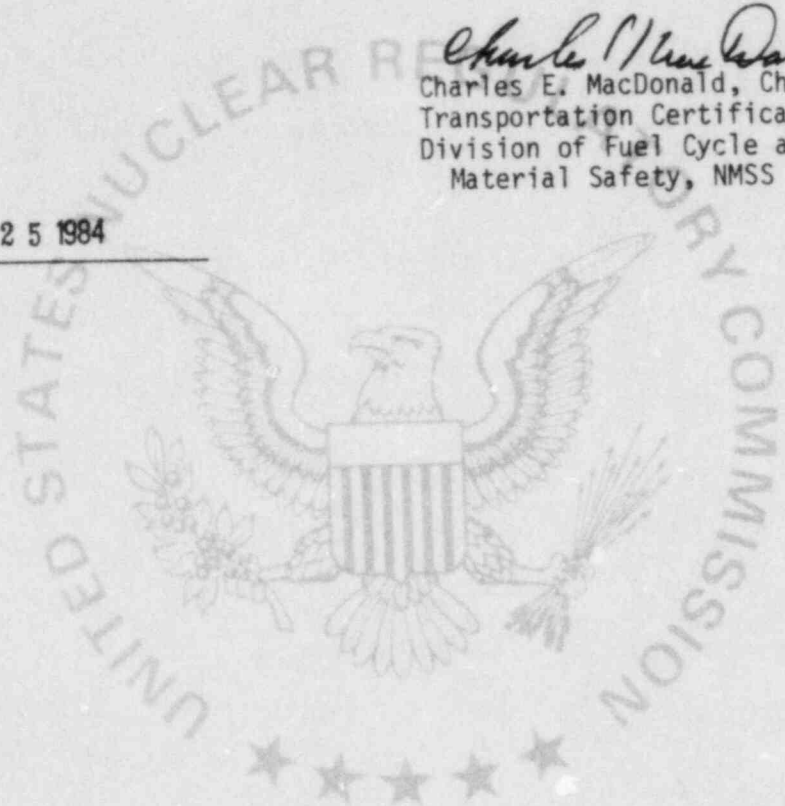
REFERENCE

Babcock & Wilcox application dated September 20, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 25 1984



CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER 5341	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/5341/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
Babcock & Wilcox Company
P. O. Box 785
Lynchburg, VA 24505
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Babcock & Wilcox application dated June 23, 1967, as supplemented.

71-5341

c. DOCKET NUMBER

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.: NFP-55

(2) Description

Packaging as described and constructed in accordance with DOT Specification 6M except: (i) the containment vessel is limited to a 5-inch Schedule 40 steel pipe with threaded cap closure and welded bottom plate; (ii) the outside drum must have at least 55-gallon capacity; and, (iii) the sides and ends of the containment vessel must have at least 7 inches of insulation with the radial clearance between the insulation and the outer shell not exceeding 5/8 inch.

(b) Contents

(1) Type and form of material

Uranyl nitrate or uranium oxides, of any enrichment in the U-235 isotope, provided the H/U-235 ratio does not exceed 20, considering all sources of moderation within the inner container.

(2) Maximum quantity of material per package

Not more than 3.6 kilograms U-235 in a volume not to exceed 3.6 liters.

Page 2 - Certificate No. 5341 - Revision No. 6 - Docket No. 71-5341

- | | | |
|----|--|-------------|
| 5. | (c) Fissile Class | II and III |
| | (1) Minimum number transport index to be shown on label for Class II | 1.3 |
| | (2) Maximum number of packages per shipment for Class III | 40 packages |
6. Pipe cap closure on the Schedule 40 pipe shall be sealed with teflon tape.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: October 31, 1989.

REFERENCES

Babcock & Wilcox Company application dated June 23, 1967.

Supplements dated: January 5, 1970; and May 14, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: OCT 25 1984

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5362	2	USA/5362/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Agriculture
Radiological Safety Staff
Beltsville, MD 20705

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Agriculture application
dated October 17, 1980.

c. DOCKET NUMBER 71-5362

4. CONDITIONS

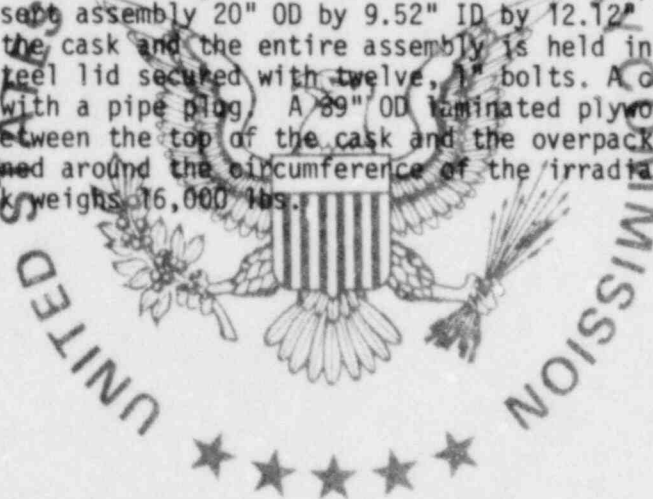
This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

- (1) Model No.: Natick Irradiator
- (2) Description

The package is a cylindrical steel-encased, lead filled weldment 29-3/4" OD by 58" high enclosed in a double-walled impact and fire shield (overpack) 57" by 45" by 90" high mounted on a pallet 57" by 45". The stepped cavity is 9.56" ID by 8-1/4", 12" ID by 27-1/2" and 20" ID by 11-58". The source holder (drawer assembly) is 9.48" OD by 46.625" with 9-1/2" shielding on bottom and 12-1/8" on top. A lead shielded cask insert assembly 20" OD by 9.52" ID by 12.12" is installed at the top of the cask and the entire assembly is held in place with a 1" thick steel lid secured with twelve, 1" bolts. A cask drain line is sealed with a pipe plug. A 39" OD laminated plywood plug fills the space between the top of the cask and the overpack. Plywood will be positioned around the circumference of the irradiator for support. The cask weighs 16,000 lbs.



Page 2 - Certificate No. 5362 - Revision No. 2 - Docket No. 71-5362

(3) Drawings

The packaging is constructed in accordance with Lockheed Nuclear Products Drawing Nos. 442-2093, Rev. 0; 442-2094, Rev. 0; 442-2096, Rev. 0; 4422098, Rev. 0; 442-3002, Rev. 0; and U.S. Army Natick Research and Development Laboratories Drawing No. FE-81-16, Rev. 0.

(b) Contents

(1) Type and form of material

Cesium 137 sources meeting requirements for special form radioactive material.

(2) Maximum quantity of material per package

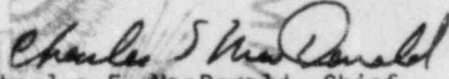
250,000 ci

6. Construction of additional packagings is not authorized.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: October 31, 1986.

REFERENCE

U.S. Department of Agriculture application dated October 17, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 5364	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/5364/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Neutron Products Incorporated 22301 Mt. Ephraim Road Dickerson, MD 20842	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Neutron Products Incorporated application dated March 26, 1974, as supplemented.
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c. DOCKET NUMBER 71-5364

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.: NPI-67-0442.
- (2) Description

The packaging is a steel encased, lead shielding shipping cask of circular cross section. The outer carbon steel shell is 7/8-inch thick, has a 30-inch OD and is finned with 1/2-inch x 4-inch fins spaced on 3-inch centers. The inner stainless steel shell is 1/4-inch thick. A minimum 6-inch lead shield is provided on the sides and ends. The cask is comprised of two (2) axially connected sections which are chosen from four (4) different sections, described as follows:

<u>SECTION</u>	<u>LENGTH (inches)</u>	<u>CAVITY CONFIGURATION</u>
A	74	A 5-inch OD center tube surrounded by 48, 1/2-inch OD and 60, 3/4-inch OD tubes within a 15-inch diameter central cavity. The space between the tubes is filled with lead.
B	54	Same as Section A.
C	31	A 15-inch diameter central cavity.
D	16	None.

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

The sections described above are connected in pairs to form four (4) cask configurations. The sections are connected by thirty-six (36), 3/4-16 UNF studs equally spaced around 34-inch OD grooved flange rings which are welded to each section. An O-ring or flat ring gasket provides a seal between the connected pairs which form the cask configurations described below:

MODE	CONNECTED SECTIONS	CASK LENGTH (inches)	CASK CAVITY LENGTH (inches)	WEIGHT (pounds)
I	A and B	114	80	30,000
II	A and C	91	58	23,000
III	B and D	60	27	15,000
IV	C and D	38	5	8,000

A steel encased, lead filled cover in Section A provides access to the cask cavity for Modes I and II. The cover is secured with twelve (12), 7/8-9UNC hex head bolts. A seal is provided by a 1/4-inch diameter by 16-1/2-inch ID O-ring. The cavity is filled with inert gas for shipment, and is provided with a relief valve set at 45 psig. The cask is fitted with lifting sockets. Section D, and the cover for Section A are fitted with lifting lugs. A 1/2-inch thick steel pad is welded to the cask, and may be used for tie-down.

(2) Drawings

The packaging is constructed in accordance with the following O.G. Kelley Co. - Neutron Products, Inc. Drawing Nos.: 67-0442-1, Rev. 8; 67-0442-2, Rev. 2; 67-0442-3, Rev. 7; 67-0442-4, Rev. 6; 67-0442-5, Rev. 2; 67-0442-6, Rev. 2; and 67-0442-7, Rev. 0.

(b) Contents

(1) Type and form of material

Cobalt 60 meeting the requirements for special form radioactive material.

(2) The maximum quantity of material per package

PACKAGING	RADIOACTIVITY CURIES OF COBALT-60	INTERNAL HEAT (kw)
Mode I	600,000	9.4
Mode II	400,000	6.2
Mode III	200,000	3.1
Mode IV	120,000	1.9

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6. The cavity shall be dried, purged and filled with an inert atmosphere prior to shipment.
7. The contents shall be held within the cavity so as to fix its position during transport.
8. The lifting lugs on Section D and the cover of Section A shall be covered, locked or removed to prevent their use for lifting or tiedown of the package during transport.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: May 31, 1989.

REFERENCES

Neutron Products, Incorporated application dated March 26, 1974.

Supplement dated: May 12, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: MAY 17 1984

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
5450	20	USA/5450/AF	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230

Westinghouse Electric Corporation application
dated December 17, 1980, as supplemented.

c. DOCKET NUMBER

71-5450

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 Nos.:

RCC, RCC-1, RCC-2, RCC-3, and RCC-4.

(2) Description

Steel fuel element cradle assembly consisting of a strongback and adjustable fuel element clamping assembly, shock mounted to a 14-gauge steel outer container by shear mounts. Neutron absorber plates are required for the contents as specified. Gross weight for the RCC and RCC-2 is 6,300 lbs., RCC-1 and RCC-3 is 7,200 lbs., and RCC-4 is 8,400 lbs.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos.: 1596E24, 1596E25, and 1553E31 for the RCC and RCC-2; 1596E24, 1596E25, and 1553E30 for the RCC-1 and RCC-3; and 1596E22, 1596E23, and 1548E55 for the RCC-4.

(4) Fuel rod container reinforced 13-gauge steel box constructed in accordance with Westinghouse Electric Corporation Drawing No. C5650D55, Rev. 7.

Page 2 - Certificate No. 5450 - Revision No. 20 - Docket No. 71-5450

5. (b) Contents

(1) Type and form of material

(i) Uranium dioxide as Zircaloy or stainless steel clad unirradiated fuel elements. Two (2) neutron absorber plates consisting of 0.19" thick, full length stainless steel containing 1.3% minimum boron or 0.19" thick OFHC copper are required between fuel elements of the following specifications:

Type	14x14 Zr Clad	15x15 Zr Clad	14x14 SST Clad	15x15 SST Clad	17x17 Zr Clad	16x16 Zr Clad	14x14 Zr Clad
Pellet diameter (nom), in	0.344-0.367	0.367	0.384	0.384	0.308-0.322	0.322	0.3805
Rod diameter (nom), in	0.400-0.422	0.422	0.422	0.422	0.360-0.374	0.374	0.44
Maximum fuel length, in	144	144	120	120	168	144	144
Maximum rods/element	180	204	180	204	264	235	176
Maximum cross section, (nom), in sq	7.8	8.4	7.8	8.4	8.4	7.8	7.98
Maximum U-235/element, kg	17.7	18.3	18.5	18.7	16.95 (144"L) 19.8 (168"L)	16.6	19.0
Maximum U-235 enrichment, w/o	4.0	3.65	4.0	3.65	3.65	4.0	3.85

(ii) Uranium dioxide as Zircaloy clad unirradiated fuel elements contained within the Model No. RCC-4 packaging. Two (2) neutron absorber plates consisting of 0.19" thick carbon steel are required between fuel elements of the following specifications:

Type	17 x 17 ZR Clad
Pellet diameter, in	0.308 - 0.322
Rod diameter, in	0.360 - 0.374
Maximum fuel length, in	168
Maximum rods/element	264
Maximum cross section, (nom), in sq	8.4
Maximum U-235/element, kg	19.3
Maximum U-235 enrichment, w/o	3.55

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(iii) Uranium dioxide as Zircaloy clad unirradiated fuel elements. Two (2) neutron absorber plates consisting of carbon steel, 0.035 inches in thickness, with 4 mils of Gd_2O_3 ($0.02 \text{ gm} - Gd_2O_3/cm^2$) affixed to each side of the plate are required between fuel elements of the following specifications:

Type	14x14 Zr Clad	15x15 Zr Clad	14x14 SST Clad	15x15 SST Clad	17x17 Zr Clad	16x16 Zr Clad
Pellet diameter (nom), in	0.344-0.367	0.367	0.384	0.384	0.308-0.322	0.322
Rod diameter (nom), in	0.400-0.422	0.422	0.422	0.422	0.360-0.374	0.374
Maximum fuel length, in	144	144	120	120	168	144
Maximum rods/element	180	204	180	204	264	235
Maximum cross section, (nom), in sq	7.8	8.4	7.8	8.4	8.4	7.8
Maximum U-235/element, kg	22.1	21.5	23.1	22.0	19.9 (144"L) 23.3 (168"L)	20.7
Maximum U-235 enrichment, w/o	5.0	4.3	5.0	4.3	4.3	5.0

(iv) Uranium dioxide as Zircaloy or stainless steel clad unirradiated fuel rods of the following specifications:

Type	SST Clad	Zr Clad	Zr Clad
Pellet diameter (nom), in	0.384-0.446	0.367	0.322
Rod diameter (nom), in	0.422-0.476	0.422	0.374
Fuel length (max), in	144	144	168
Maximum U-235 enrichment, w/o	4.02	4.0	3.65

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- (v) Uranium dioxide as a Zircaloy clad unirradiated fuel element. Two (2) neutron absorber plates consisting of 0.19" thick, full length stainless steel containing 1.3% minimum boron or 0.19" thick OFHC copper are required in the shipping container. The fuel assembly shall have the following specifications:

17 x 17 Zr Clad Element

Pellet diameter (nom), in	0.322
Rod diameter (nom), in	0.374
Maximum fuel length, in	144
Maximum rods/element	264
Maximum cross section, (nom), in sq	8.4
Maximum U-235/element, kgs	17.6
Maximum U-235 enrichment, w/o	3.80

- (2) Maximum quantity of material per package
 - (i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii):
Two fuel elements.
 - (ii) For the contents described in 5(b)(1)(iv):
Two inner containers containing not more than 80 kilograms U-235.
 - (iii) For the contents described in 5(b)(1)(v):
One fuel element plus one dummy fuel assembly.

5. (c) Fissile Class II and III

- (1) Minimum transport index to be shown on label for Class II 1.2
- (2) Maximum number of packages per shipment for Class III 60

- 6. Fuel rods shall be closely packed in the fuel rod container on no more than an equivalent metal-to-metal square lattice. Partially loaded fuel rod containers shall be fitted with a minimum of three, equally spaced blocks, of which the noncombustible portion of the blocks and the method by which they are secured shall assure that the rods are maintained on no more than an equivalent metal-to-metal square lattice within the fuel rod container.

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7. Each fuel assembly shall be unsheathed or shall be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath shall not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

Alternatively, the fuel assembly may be enclosed in an elongated plastic bag or sheath along its full length. At the bottom end of the fuel assembly, the bag will be cut off or folded back to assure that the entire cross section of the lower end of the assembly is unobstructed. When folding is used, the portion of the sheath that is folded back will be cinched with tape near its end to hold it in place, and the length will be such that when the assembly is loaded in the packaging, the folded sheath will be clamped in place in at least two grid locations. The top end of the bag may be gathered together and taped closed. However, the top end then will be slit on all four sides. The slits will run perpendicular to the axis of the assembly and will extend the inner distance between the top nozzle pads and spring clamps (approximately 60% of the length of each side). The slits will be made in a plane near that formed by the top of the pads and clamps.

8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: January 31, 1986.

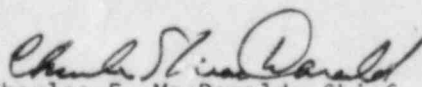
REFERENCES

Westinghouse Electric Corporation application dated December 17, 1980.

Supplements dated: January 21 and September 4, 1981; March 8, 1982; and June 14 and October 4, 1983.

Department of Energy supplement dated: March 1, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 24 1984

**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
5461	1	USA/5461/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for Packaging (SARP) of
the Oak Ridge National Laboratory TRU Curium
Shipping Container, Report No. ORNL-5147/RI,
August 7, 1981 Revision.

c. DOCKET NUMBER

71-5461

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: ORNL TRU Curium Shipping Container
- (2) Description:

Packaging for solid radioactive materials. The container is a right circular cylinder 29 inches in diameter and 30-7/8 inches high with a 304L stainless steel outer shell which is 3/8-inch thick for the bottom and sides and 1/4-inch thick for the top. The shell for inner cavity is 8-1/4 inches in diameter x 19-1/4 inches deep, is fabricated from 1/4-inch thick 304L stainless steel plate, and is recessed 1-3/8 inches from the top. The inner cavity for the radioactive materials is 6 inches in diameter x 8 inches high and fabricated from 1/4-inch thick 304L stainless steel. Seven-eighths-inch thick lead fills the space between the sides and bottom of the cavity shell and the inner cavity. The annulus between the outer shell and inner shell is filled with limonite concrete. The inner cavity is closed with a concrete-and-lead plug which is enclosed in 1/4-inch thick 304L stainless steel plate. A 1/16-inch thick Neoprene gasket serves as a seal between the top flange of the plug and the cask body. Eight, 1/2"-13 UNC-2 nuts on studs hold the plug flange to the cask body. A 3/8-inch diameter 304L stainless steel bail is used to lift the plug. A 1/4-inch thick 304L stainless steel plate, which covers the top 13UNC-2 nuts on studs. The cask is equipped with four, 1/2-inch thick lifting and tie-down ears with two, 1-inch diameter holes per ear. The cask is mounted on a skid. The gross weight of the cask and skid is 2,800 pounds.

Page 2 - Certificate No. 5461 - Revision No. 1 - Docket No. 71-5461

5. (a) (3) Drawing

The packaging for the TRU Curium Shipping Container is constructed in accordance with Oak Ridge National Laboratory Drawing No. M-12175-CP-078-E-3 (Report No. ORNL-5147/RI, August 7, 1981 Revision).

(b) Contents

(1) Type and form of material

- (i) Transuranics, including any isotopes of curium, berkelium, californium, and fermium in the form of metal, oxide, chloride, or other salt contained in capsules that meet the requirements of special form radioactive material.
- (ii) Transuranics, including any isotopes of plutonium in the form of metal, oxide, chloride, or other salt doubly encapsulated in capsules that each meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

The maximum internal heat not to exceed 150 watts;

- (i) For the material described in 5(b)(1)(i) a total of 10 g or any combination of Am-242, Cm-243, Cm-245, Cm-247, or Cf-249.
- (ii) For the material described in 5(b)(1)(i) a total of 3 g of Cf-251.
- (iii) For the material described in 5(b)(2)(ii) the total of any combination of Pu-239 and Pu-241 shall be limited to 10 g.

- 6. Special form radioactive material capsules may be held within DOT Specification 2R containers.
- 7. The package authorized by this certificate is hereby approved for use under general provisions of 10 CFR §71.12.
- 8. Expiration date: June 30, 1986.

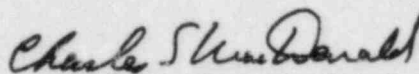
CONDITIONS (continued)

Page 3 - Certificate No. 5461 - Revision No. 1 - Docket No. 71-5461

REFERENCE

Safety Analysis Report for Packaging (SARP) of the Oak Ridge National Laboratory TRU Curium Shipping Container, August 7, 1981 Revision to Report No. ORNL-5147/RI.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



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
5463	2	USA/5463/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Union Carbide Corporation
Nuclear Division
Oak Ridge Y-12 Plant, P.O. Box Y
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for Packaging (Oak Ridge
Y-12 Plant Foamglas Shipping Package for Enriched
Uranium) Report No. Y-DD-156, September 1974.

c. DOCKET NUMBER 71-5463

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.: FD

(2) Description

Packaging for uranium enriched in the U-235 isotope. The containment vessel consists of DOT Spec 2A or 2N metal inner container, 6-3/16 inches diameter by 8-3/4 inches high. The containment vessel is centered and supported within a 16-gage outer steel drum with a 14-gage head, DOT Spec 6J or equivalent, by solid foamed boron silicate glass. The outer steel drum is 22-1/2 inches diameter by 22 inches high. The outer steel drum closure must be at least a 12-gage bolted ring with drop forged lugs, one of which is threaded, and having a 5/8-inch steel bolt and lock nut. The package gross weight is 145 pounds.

(3) Drawing

The packaging is as described and fabricated in accordance with Union Carbide Corporation, Nuclear Division, Y-12 Plant Drawing No. E-T-55301.

Page 2 - Certificate No. 5463 - Revision No. 2 - Docket No. 71-5463

5. (b) Contents

(1) Type and form of material

Uranium metal, alloys or dry compounds, of any enrichment in the U-235 isotope.

(2) Maximum quantity of material per package not to exceed Type A quantity radioactive material and:

(i) Not more than 3.7 kg of U-235, or

(ii) Not more than 19.0 kg of U-235 with the H/U ratio not more than 2, considering all sources of hydrogen within the inner containment vessel.

(c) Fissile Class

I, II and III

(1) Class I

For the contents described in 5(b)(1) and limited in 5(b)(2)(i).

(2) Minimum transport index to be shown on label for Class II

For the contents described in 5(b)(1) and limited in 5(b)(2)(ii):

0.5

(3) Maximum number of shipment 5(b)(1) and limited in for Class III

For the contents described in packages per 5(b)(1) and limited in 5(b)(2)(ii):

200

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

7. Expiration date: July 31, 1986.

Page 3 - Certificate No. 5463 - Revision No. 2 - Docket No. 71-5463

REFERENCE

Safety Analysis Report for Packaging (Oak Ridge Y-12 Plant Shipping Package for Enriched Uranium) Report No. Y-DD-156, September 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
5468	2	USA/5468/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Nuclear Fuel Services, Inc. P.O. Box 218 Erwin, TN 37650	Nuclear Fuel Services, Inc., application dated May 1, 1967, as supplemented.
	c. DOCKET NUMBER 71-5468

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.: NFS-IX-A

(2) Description

Oak wood container 48" x 62" x 13-1/2" outside dimensions with an internal cavity 36" x 50" x 1-1/2" lined with 0.020" thick cadmium.

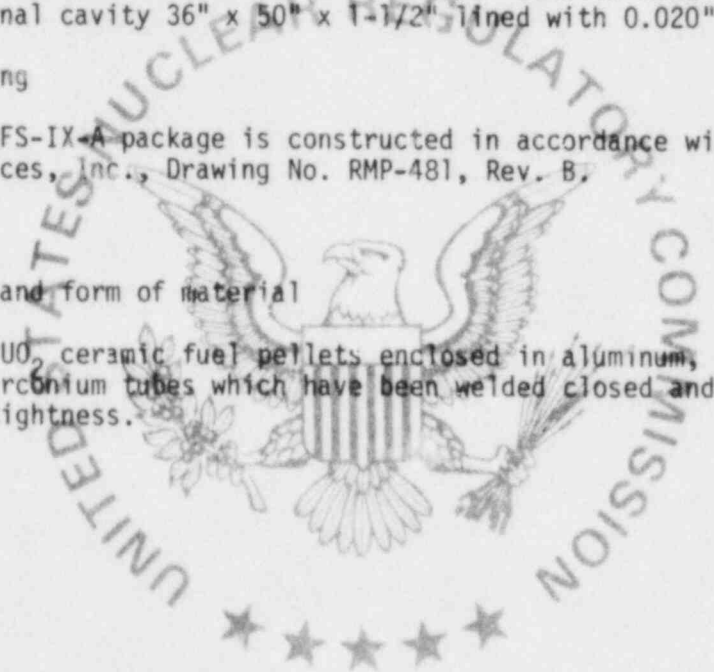
(3) Drawing

The NFS-IX-A package is constructed in accordance with Nuclear Fuel Services, Inc., Drawing No. RMP-481, Rev. B.

(b) Contents

(1) Type and form of material

PuO₂-UO₂ ceramic fuel pellets enclosed in aluminum, stainless steel, or Zirconium tubes which have been welded closed and tested to show leaktightness.



Page 2 - Certificate No. 5468 - Revision No. 2 - Docket No. 71-5468

(2) Maximum quantity of material per package

Total contents not to exceed 350 pounds and for the following w/o PuO₂/UO₂, the slab thickness must not exceed:

<u>w/o PuO₂*</u>	<u>Slab Thickness, Inches</u>
100	0.60
90	0.67
80	0.75
70	0.86
60	0.94
50	1.05
40	1.12
30	1.20
20	1.26
10	1.35

*For UO₂ containing 1% U-235 or more, the U-235 must be considered as Pu in determining w/o PuO₂.

(c) Fissile Class

I

5. Internal cavity of the shipping container must be filled with rubber or other packing material to maintain at least the specified slab thickness. Not more than 1/2-inch of elastic materials must be used for maintaining the slab thickness for fuel rods 1-inch diameter or less.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: January 31, 1987.

REFERENCES

Nuclear Fuel Services, Inc., application dated May 1, 1967.

Supplement dated: May 26, 1967

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
5492	4	USA/5492/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- b. This certificate does not relieve the consignor from compliance with any requirement or regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or in 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. PREPARED BY (Name and Address):

Nuclear Fuel Services, Inc.
P.O. Box 218
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Fuel Services, Inc. application dated
August 25, 1982, as supplemented.

c. DOCKET NUMBER

71-5492

4. CONDITIONS

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

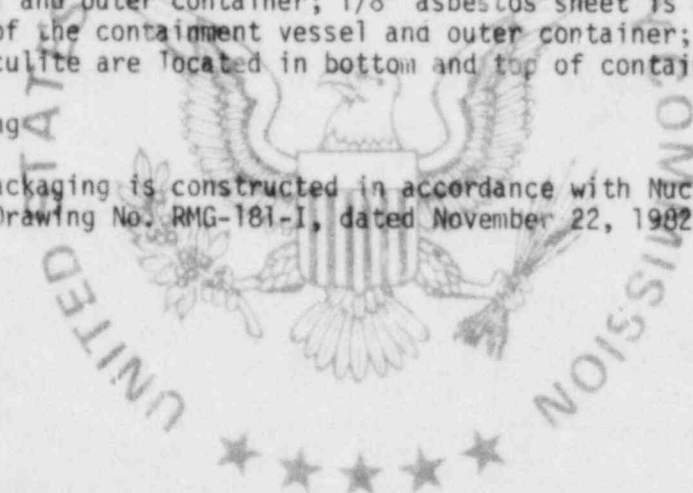
5. (a) Packaging

- (1) Model No.: RMG-181-I
- (2) Description

The containment vessel is a 5-inch Schedule 40 steel pipe with ASA standard threaded pipe cap closure at both ends with the bottom cap welded to the pipe and contains sealed polyethylene bottles and/or sealed metal cans. The containment vessel is supported in a DOT Specification 17H steel drum as shown in Drawing No. RMG-181-I. Vermiculite is used to fill the entire void between the containment vessel and outer container; 1/8" asbestos sheet is placed between both ends of the containment vessel and outer container; three inches of vermiculite are located in bottom and top of containment vessel.

(3) Drawing

The packaging is constructed in accordance with Nuclear Fuel Services, Inc. Drawing No. RMG-181-I, dated November 22, 1982.



Page 2 - Certificate No. 5492 - Revision No. 4 - Docket No. 71-5492

5. (b) Contents

(1) Type and form of material

- (i) Uranium or any uranium compound or solution, any U-235 enrichment.
- (ii) U-235 as metal or oxide, or as compounds or alloys having a maximum H/U-235 ratio of 3 considering all sources of hydrogen within the inner container.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i):

Ten kilograms U-235 contained in a maximum of 100 pounds of material.

(ii) For the contents described in 5(b)(1)(ii):

Fourteen kilograms U-235 contained in a maximum of 100 pounds of material.

5. (c) Fissile Class

II and III

(1) Minimum transport index to be shown on label for Class II

For the contents described in 5(b)(1)(ii) and limited in 5(b)(2)(ii): 1.3

(2) Maximum number of packages per shipment for Class III

For the contents described in 5(b)(1)(i) and limited in 5(b)(2)(i): Eighteen (18)

6. A minimum 1-inch thick by 4-3/4-inch diameter wood block must be inserted at each end of the containment vessel so that the contents are between the wood blocks. The specified thickness of vermiculite required at each end of the containment vessel may be reduced by an amount equal to the thickness of each wood block.

Page 3 - Certificate No. 5492 - Revision No. 4 - Docket No. 71-5492

- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: January 31, 1988.

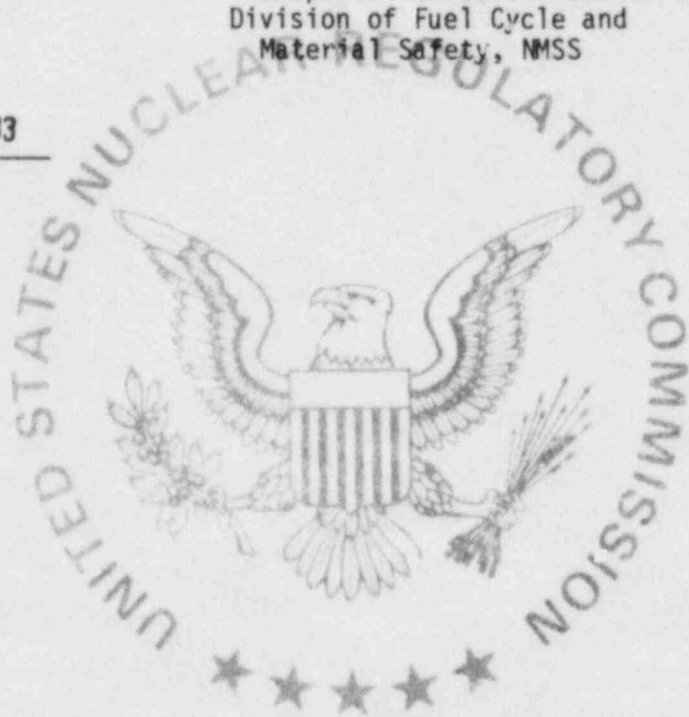
REFERENCES

Nuclear Fuel Services, Inc application dated August 25, 1982.
Supplement dated: December 10, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
5517	3	USA/5517/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Fuel Services, Inc.
P.O. Box 218
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation application
dated December 15, 1967, as supplemented.

c. DOCKET NUMBER

71-5517

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:

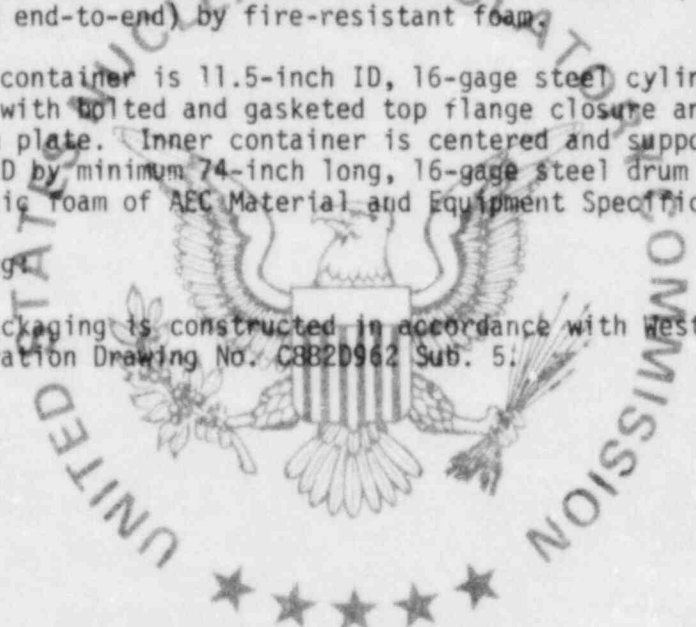
- (1) Model No.: BB 250-1
- (2) Description:

A uranium dioxide powder shipping container, consisting of a steel cylinder held in the center of an outer container (two steel drums welded end-to-end) by fire-resistant foam.

Inner container is 11.5-inch ID, 16-gage steel cylinder, 63.5 inches long, with bolted and gasketed top flange closure and seal welded bottom plate. Inner container is centered and supported in a 22.5-inch ID by minimum 74-inch long, 16-gage steel drum by fire resistant phenolic foam of AEC Material and Equipment Specification SP-9.

- (3) Drawing:

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. C8B2D962 Sub. 5.



Page 2 - Certificate No. 5517 - Revision No. 3 - Docket No. 71-5517

5. (b) Contents:

(1) Type and form of material:

Bulk uranium oxide (UO_2 or U_3O_8) powder with a maximum density of 2 g U/cc and enriched to a maximum 4 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the inner container shall not exceed 1.13.

(2) Maximum quantity of material per package:

Total contents not to exceed 250 pounds, with the U-235 content not to exceed four (4) kilograms.

(c) Fissile Class

I

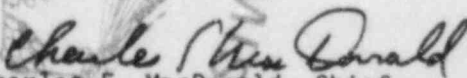
6. Prior to each shipment, the lid gasket shall be inspected. The gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: March 31, 1985.

REFERENCES

Westinghouse Electric Corporation application dated December 15, 1967.

Supplement dated: January 18, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5552	0	USA/5552/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Oak Ridge Operations
P.O. Box E
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for Packaging: The ORNL
Gas-Cylinder Fire and Impact Shield. Report
No. ORNL/ENG/TM-5/R1, April 1983.

c. DOCKET NUMBER

71-5552

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.: Gas Cylinder Fire Impact Shield
- (2) Description

A protective overpack for gas cylinders. The overpack is a nominal 80-gallon, 16-gage steel drum with a welded steel closure flange. Positive closure of the foam-filled gasketed lid is provided by 8, 3/8-inch diameter steel bolts. A 16-gage steel liner with a bolted and gasketed closure provides a cavity 11-7/8 inches in diameter by 30-5/8 inches high. The steel liner is centered within the outer drum. The space between the steel liner and outer drum is filled with fire resistant phenolic foam meeting BMS specification SP-9. Wood bracing is used to support the inner liner. Gas cylinders, nominal 2, 5, and 10 liter capacity, provide containment. The gas cylinders are positioned within the steel liner using padded inserts to prevent movement. The overall package is 24 inches in diameter, 41-1/8 inches high and has a maximum gross weight of 750 pounds.

(3) Drawings

The packaging is constructed in accordance with drawings in Figures A.1 through A.6 in ORNL Report No. ORNL/ENG/TM-5/R1, April 1983.

Page 2 - Certificate No. 5552 - Revision No. 0 - Docket No. 71-5552

5. (b) Contents

(1) Type and form of material

Tritium gas (uncompressed)

(2) Maximum quantity of material per package

Maximum decay heat load not to exceed 5 watts; maximum activity not to exceed 30,000 curies; internal pressure of containment vessel when loaded not to exceed 11.8 psia at 70°F.

6. The package must be leak tested in accordance with procedure 16A dated October 11, 1978.

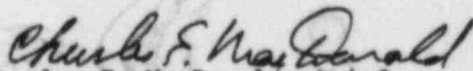
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

8. Expiration date: July 31, 1988.

REFERENCES

Dak Ridge National Laboratory Report No. ORNL/ENG/TM-5/R1, April 1983.
Supplement dated: July 6, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety

Date: JUL 13 1983

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
5563	5	USA/5563/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Babcock & Wilcox Company
P.O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company application
dated November 6, 1967, as amended.

c. DOCKET NUMBER

71-5563

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 Nos.: 660C and 660B
- (2) Description

Model No. 660C packaging is constructed as described in Babcock & Wilcox Company's application dated November 6, 1967. Model No. 660B packaging is constructed in accordance with Division of Naval Reactors letter (NR:RR:FRH G-# 2248) dated September 25, 1969.

(b) Contents

- (1) Type and form of material
Unirradiated fuel cluster.
- (2) Maximum quantity of material per package

One fuel cluster containing U-235 as specified in Babcock & Wilcox Company's application dated November 6, 1967.

(c) Fissile Class III

Maximum number of packages
per shipment. One (1)

Page 2 - Certificate No. 5563 - Revision No. 5 - Docket No. 71-5563

- 6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 7. Expiration date: October 31, 1989.

REFERENCES

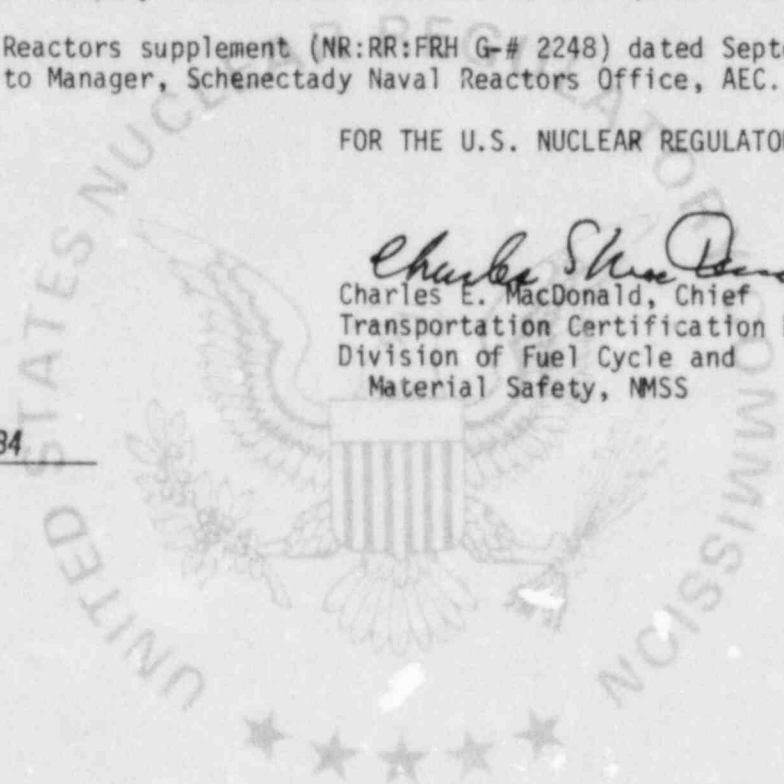
The Babcock & Wilcox Company letter dated November 6, 1967 (classified).

Division of Naval Reactors supplement (NR:RR:FRH G-# 2248) dated September 25, 1969 from R. E. Kosiba to Manager, Schenectady Naval Reactors Office, AEC.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: OCT 25 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. CERTIFICATE NUMBER	2. REVISION NUMBER	3. PACKAGE IDENTIFICATION NUMBER	4. PAGE NUMBER	5. TOTAL NUMBER PAGES
5580	2	USA/5580/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for S5W Power Unit
shipping container dated August 9, 1968.

c. DOCKET NUMBER

71-5580

4. CONDITIONS

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

5.

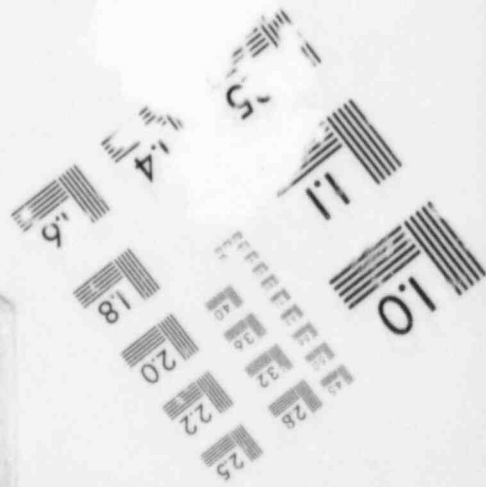
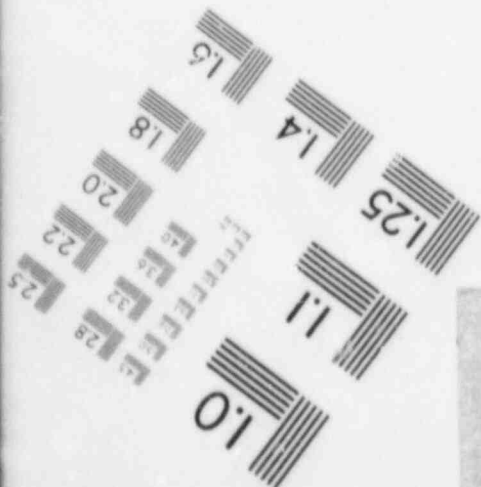
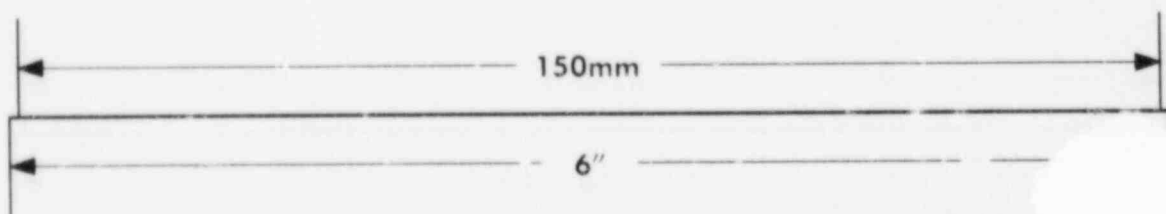
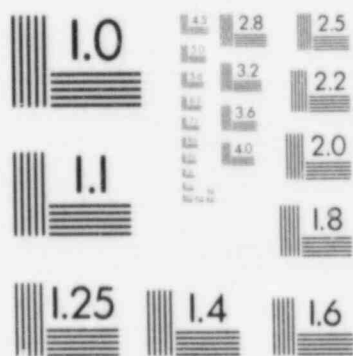
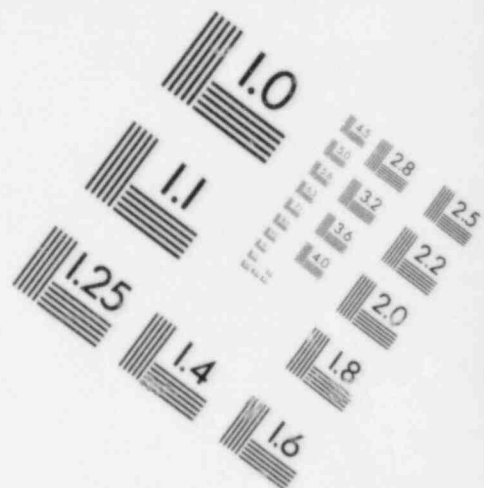
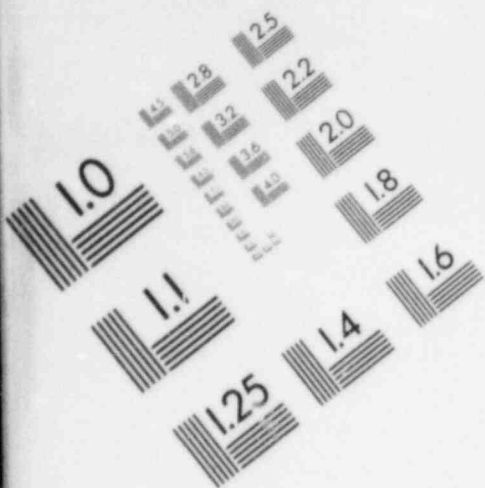
(a) Packaging

- (1) Model No.: S5W Power Unit
- (2) Description

The S5W Power Unit shipping container (PUSC) is a container and support assembly designed to ship and store new naval reactor power units. The PUSC is comprised essentially of three major assemblies: (1) the outer frame, (2) the inner frame, and (3) the shipping container. During shipment, the shipping container is bolted to the inner frame in a horizontal position. Two trunnions welded to the middle section of the shipping container support the lower end of the container and also provide the means whereby the container can be rotated from the horizontal (shipping) attitude to the vertical (loading-unloading) attitude in the inner frame. The trunnions turn in trunnion bases which are bolted to the inner frame. The inner frame and shipping container are supported by the outer frame and pedestal through 80 elastic shock mounts, each of which is secured to both the inner frame and outer frame.

Approximate dimensions of the three major assemblies of the PUSC are: Shipping container: 95 inches diameter by 236 inches; Inner Frame: 109 inches width by 52 inches height by 269 inches length; Outer Frame: 121 inches width by 56 inches height by 236 inches length. Maximum weight of the loaded PUSC is approximately 127,900 lbs.

IMAGE EVALUATION
TEST TARGET (MT-3)



Page 2 - Certificate No. 5580 - Revision No. 2 - Docket No. 71-5580

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 936F963, Rev. 3 and 936F964, Rev. 2.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type,

- (i) S5W Core 4 power unit with control rods installed and secured in place by holddown mechanism.
- (ii) S3G Core 3 power unit with control rods installed and secured in place by holddown mechanism.

(2) Maximum quantity of material per package

One fuel assembly as described in 5(b)(1)(i) or 5(b)(1)(ii).

(c) Fissile Class

III

Maximum number of packages
per shipment:

One (1)

6. Expiration date: March 31, 1988.

REFERENCE

Safety Analysis Report for S5W Power Unit Shipping Container, WAPD-OP(R)SA-820 dated August 9, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
5595	0	USA/5595/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
P.O. Box E
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for Packaging: The
ORNL Uranium-Shielded Shipping Cask, ORNL
Report No. ORNL/ENG/TM-4, Second Revision
June 1983, as supplemented.

c. DOCKET NUMBER

71-5595

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 Nos.: L and M
- (2) Description

Steel encased, uranium shielded longitudinally finned shipping casks. The containment vessels for both models meet special form requirements and are held within 11-inch diameter by 17-1/2-inch high cavities. Positive closure of the lids is accomplished by: twelve, 3/4-10 UNC bolts for the Model No. L and sixteen, 3/4-10 UNC bolts for the Model No. M. Both models have 3-inch deep fins, are mounted to a 69-inch square skid, and are enclosed within a mesh personnel heat shield.

The Model No. L has a 25-1/2-inch O.D. (excluding fins); is 39-3/4 inches high; has a 35-5/8-inch diameter bottom lug plate; a maximum uranium shield thickness of 6-7/34 inches; and a gross weight of 13,200 pounds.

The Model No. M has a 25-inch O.D. (excluding fins); is 38 inches high; has a 35-1/8-inch diameter bottom lug plate; a minimum uranium shield thickness of 6 inches; and a gross weight of 11,600 pounds.

- (3) Drawings

The packagings are constructed in accordance with the following Union Carbide Corporation, Nuclear Division, Paducah Plant Drawing Nos.: Model No. L, M-11572-EM-001-E through M-11572-EM-003-E; Model No. M, M-11572-EM-010-E through M-11572-EM-014-E.

Page 2 - Certificate No. 5595 - Revision No. 0 - Docket No. 71-5595

(b) Contents

(1) Type and form of material

Solid, non-fissile radioactive material encapsulated to meet the requirements of special form material as defined in 10 CFR §71.4.

(2) Maximum quantity of material per package

The maximum internal heat must not exceed 5,000 watts.

6. Packages having internal heat greater than 1,250 watts must be shipped as exclusive use.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: October 31, 1988.

REFERENCES

Oak Ridge National Laboratory Report No. ORNL/ENG/TM-4, Second Revision, June 1983.
DOE Supplement dated: September 30, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Olegarden
for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 13 1983

**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
5607	5	USA/5607/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): E. I. DuPont de Nemours and Company Savannah River Laboratory Aiken, SC 29801	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: T-2 Shipping Package, Safety Analysis Report, Draft: April 1980, as amended.	c. DOCKET NUMBER: 71-5607

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.: T-2

(2) Description

Packaging for irradiated reactor fuel and components consisting of a lead encased in steel cask, removable containment vessel insert and shipping case.

The cask is a double-walled steel circular cylinder with thickened shielding in the center portion. The central cavity is 6.065 inches in diameter by 100 inches long. The lead shielding is 9-1/2 inches thick along a 45-inch center section reduced to 5-5/16 inches at each 36-inch end section. The containment vessel is positioned within the cask. Cask closure is accomplished by a gasketed and bolted steel plug. The cask is enclosed in the shipping case which is 36 inches in diameter by 133 inches long welded to a 4-foot by 6-foot steel pallet. The maximum weight of the packaging is 18,400 pounds.

Page 2 - Certificate No. 5607 - Revision No. 5 - Docket No. 71-5607

5. (a) (3) Drawings

- (i) The shipping case is constructed in accordance with DuPont Drawing Nos.: W716539, Rev. 0; 180191, Rev. 1; 180192, Rev. 0; 180193, Rev. 1; 180194, Rev. 0; 180197, Rev. 0; W716538, Rev. 0; 180195, Rev. 0; 180196, Rev. 0; and 180089, Rev. 0.
- (ii) The cask is constructed in accordance with General Electric Drawing Nos.: 919D755, Rev. 0; 135C5202, Rev. 0; 153F966, Rev. 0; and 106D3721, Rev. 0; or it is constructed in accordance with DuPont Drawing Nos.: W239534, Rev. 2; 147214, Rev. 15; 147215, Sheet 2, Rev. 2; and 147216, Rev. 1.
- (iii) The ANL insert is constructed in accordance with Argonne National Laboratory Drawing Nos.: W0147-0227-DD, Rev. 7; W0147-0228-DD, Rev. 6; W0147-0229-DC, Rev. 6; W0147-031-DD, Rev. 3; W0147-0234-DC, Rev. 4; and W0147-312-DE, Rev. 2.
- (iv) The TREAT Vessel insert is constructed in accordance with Westinghouse Hanford Company Drawing Nos.: H-3-39082, Rev. 0; H-3-36134, Rev. 2; and H-3-36823, Rev. 1.

(b) Contents - air as primary coolant.

(1) Type and form of material

- (i) Irradiated clad fuel in the form of solid metal, oxides, nitrides, and carbides of uranium, plutonium, or mixed uranium-plutonium contained within the ANL insert or TREAT Vessel insert. The clad fuel may contain small quantities of Na or NaK. The minimum cooling time must be no less than 150 days.
- (ii) Irradiated clad fuel pins of uranium dioxide enriched to up to 3.0 w/o in U-235 contained within the ANL insert or TREAT vessel insert. Average exposure of fuel not to exceed 18 megawatt days per kilogram. The clad fuel may contain small quantities of Na or NaK. The minimum cooling time must be no less than 90 days.
- (iii) Irradiated reactor components held within the container shown in Drawing No. W0147-0234-DC, Rev. 3.

Page 3 - Certificate No. 5607 - Revision No. 5 - Docket No. 71-5607

5. (b) (2) Maximum quantity of material per package.

Internal decay heat not to exceed 208 watts, and:

(i) For the material described in 5(b)(1)(i), fissile material not to exceed 1.71 kg.

(ii) For the material described in 5(b)(1)(ii), fissile material (U-235) not to exceed 300 grams.

(c) Fissile Class for the material described in 5(b)(1)(i) and 5(b)(1)(ii), and limited in 5(b)(2)(i) and 5(b)(2)(ii) I

6. The contents must be shipped dry. When loaded underwater, the package must be dried using Consumer Power Company's procedure, "T-2 Cask Liner Assembly Drying Procedure," Proc. No. EE&T-C12, Rev. 1, 11/12/81.

7. The ANL Insert and Treat Vessel insert must be leak tested prior to first use and annually thereafter in accordance with the procedures specified in Argonne National Laboratories Document No. W0195-0054-ES-00.

Prior to each shipment, the package must be leak tested in accordance with procedures specified in Appendix A to HFEF/N ONM 6202, Rev. 2, March 17, 1981.

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

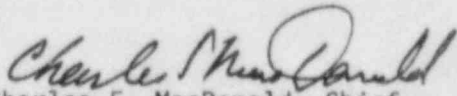
10. Expiration date: March 31, 1987.

REFERENCES

DuPont Safety Analysis Report, Draft April 1980.

Department of Energy supplements dated: February 11, April 8 and 20, 1982 and April 12, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

te: SEP 19 1983

**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
5641	6	USA/5641/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

United Nuclear Corporation
67 Sandy Desert Road
Uncasville, CT 06382

United Nuclear Corporation application dated
February 1, 1982.

c. DOCKET NUMBER

71-5641

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.: UNC-2500

(2) Description

Specific packaging is not required. Safety of shipment is independent of packaging.

(b) Contents

(1) Type and form of material

Unirradiated fuel clusters, modules or other assemblies.

(2) Maximum quantity of material per shipment

Not to exceed a Type A quantity of radioactive material; and

Dry Shipment

[Interspersed hydrogenous material limited to an H to U-235 atomic ratio of three (3) or less.]

Shipment limited to:

(i) The stated dry safe quantities (without reference to notes or supplements), but excluding those parts named as "elements" as given in Table 10.0-1 (pp 10.0-4 through 10.0-7D), as approved on or before May 18, 1983 to SNM License No. 368; or

(ii) 700 grams U-235; or

(iii) Single fabricated fuel part not exceeding 40 g U-235/inch.

Page 2 - Certificate No. 5641 - Revision No. 6 - Docket No. 71-5641

5. (b) Contents (continued)

Moderated Shipment

Shipment limited to:

- (i) The stated wet safe quantities (without reference to notes or supplements), but excluding those parts named as "elements" as given in the above referenced table; or
- (ii) 500 gram U-235; or
- (iii) A single fabricated fuel part not exceeding 20 g U-235/inch.

(c) Fissile Class

III

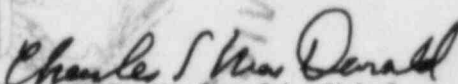
- 6. The name plate to which the model number is affixed must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintain its legibility.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: March 31, 1986.

REFERENCES

United Nuclear Corporation application dated February 1, 1982.

Supplements dated: April 25 and June 1 and 21, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5687	3	USA/5687/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Fuel Services, Inc.
P.O. Box 218
Erwin, TN 37650

Nuclear Fuel Services, Inc. application dated
August 25, 1982

c. DOCKET NUMBER 71-5687

4. CONDITIONS

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

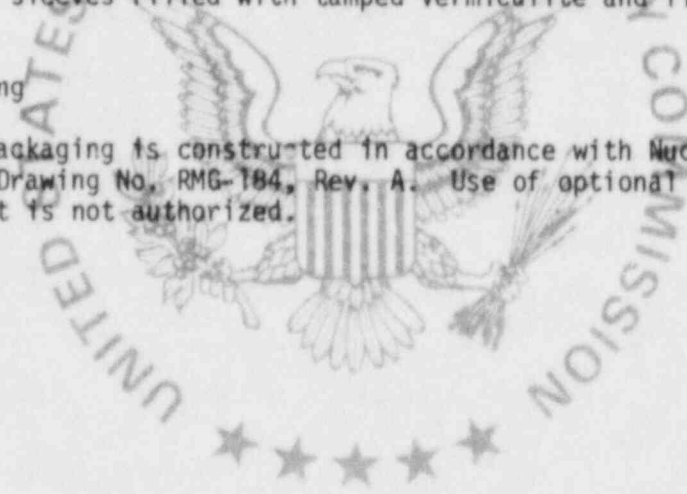
5. (a) Packaging

- (1) Model No.: RMG-184
- (2) Description

The containment vessel is a 5-gallon bucket, DOT Specification 17H. Closure is by means of lug-clamps used with a new lid and gasket for each shipment. The outer container, a 55-gallon DOT Specification 17H steel drum and gasketed lid is closed by a 12-gauge bolted ring with drop forged lugs, one of which is threaded, having a 5/8-inch bolt. The containment vessel is supported in the outer container by two, 26 gauge sleeves filled with tamped vermiculite and fire retardant polyurethane foam.

(3) Drawing

The packaging is constructed in accordance with Nuclear Fuel Services, Inc. Drawing No. RMG-184, Rev. A. Use of optional 5-gallon insulator bucket is not authorized.



Page 2 - Certificate No. 5687 - Revision No. 3 - Docket No. 71-5687

5. (b) Contents

(1) Type, form, and maximum quantity of material per package

(i) Oxides of uranium, at uranium densities not to exceed 3.2 g/cc. Not to exceed one hundred pounds of product with the maximum enrichment in the U-235 isotope not to exceed 10 w/o. H/U-235 ratio, considering all sources of moderation within containment vessel and maximum U-235 content must not exceed:

<u>Enrichment</u> <u>% U-235</u>	<u>Maximum</u> <u>H/U-235</u>	<u>U-235 Content</u> <u>Kilograms</u>
1	20	0.401
2	10	0.802
3	5	1.203
4	5	1.604
5	3	2.005
6	3	2.405
7	3	2.805
8	2	3.205
9	2	3.605
10	2	4.005

(ii) Uranium oxide or metal, at uranium densities exceeding 3.2 g/cc. Not to exceed one hundred pounds of product with the maximum enrichment in the U-235 isotope not to exceed 5 w/o. H/U-235 ratio, considering all sources of moderation within containment vessel and maximum U-235 content must not exceed:

<u>Enrichment</u> <u>% U-235</u>	<u>Maximum</u> <u>H/U-235</u>	<u>U-235 Content</u> <u>Kilograms</u>
1	20	0.401
2	10	0.802
3	5	0.700
4	5	0.700
5	3	0.700

CONDITIONS (continued)

Page 3 - Certificate No. 5687 - Revision No. 3 - Docket No. 71-5687

5. (c) Fissile Class II and III

(1) Minimum transport index to be shown on label for Class II	Maximum Enrichment % U-235	Transport Index
	3	0.2
	7	0.4
	10	0.7
(2) Maximum number of packages per shipment for Class III	Maximum Enrichment % U-235	Number of Packages
	3	1,550
	5	390
	7	330
	10	234

- 6. Uranium enriched to greater than 6 w/o in the U-235 isotope must be packaged within a 3-gallon metal can or plastic bottle surrounded by vermiculite within the 5-gallon bucket.
- 7. During transport and storage, the eight (8), 1/4-inch vent holes in the lid or the optional arrangement of four (4), 1/2-inch vent holes in the sides of the drum near the top must be covered with tape to preclude entry of rain water into the packaging.
- 8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 9. Expiration date: September 30, 1987.

REFERENCE

Nuclear Fuel Services, Inc. application dated August 25, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
5740	1	USA/5740/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Packaging (SARP) of the
Oak Ridge National Laboratory TRU Californium
Shipping Container, August 7, 1981, Rev. of
Report No. ORNL-5409/R1.

c. DOCKET NUMBER

71-5740

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.: ORNL TRU Californium Shipping Container
- (2) Description

A 304L stainless steel encased concrete shipping cask. The outer shell consists of two, 1/2-inch thick, 66-inch diameter hemispherical heads joined by a 6-inch cylindrical section. The cylindrical cavity has a 1-inch thick stainless steel wall and is 3 inches in diameter x 6 inches long. Shielding consists of 30 inches of Blackburn Limonite concrete having a density of approximately 175 lb/ft³. Upper and lower level ball valves located at the end of concrete filled plugs define, isolate, and seal the cavity. Both of these plugs have O-ring seals, are bolted in place and are protected with a gasketed cover plate. Fusible plugs are located in the cover plates and the shell.

The top ball valve and plug may be replaced by other plugs for multiple source shipments. Sources are contained in special form containers.

The cask is mounted onto a 1-inch thick steel base plate by eight steel 2-1/2 inch NPS Schedule 40 pipe struts. The cask is transported on a special trailer. The package gross weight is 23,500 pounds.

Page 2 - Certificate No. 5740 - Revision No. 1 - Docket No. 71-5740

5. (a) Packaging (continued)

(3) Drawings

The package and special trailer are constructed in accordance with Oak Ridge National Laboratory (ORNL) Drawing Nos. M-11230-EN-001-D through 008-D, 012-E, 014-E, 017-D and 018-E, and M-12166-CD-019-D. (Appendix A, August 7, 1981 revision of ORNL-5409/R1.)

(b) Contents

(1) Type and Form of Material

The contents consist of isotopes of Americium (Am), Curium (Cm), Berkelium (Bk), Californium (Cf), Einsteinium (Es), and Fermium (Fm) as a solid (metal, oxide, oxysulfate, or dry salt), contained in capsule(s) that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

For the contents described in 5(b)(1):

Three (3) grams and the maximum internal heat not to exceed 5 watts.

6. A minimum of two lifting ribs shall be used to lift the package.
7. The package authorized by this certificate is hereby approved for use under general license provisions of 10 CFR §71.12.
8. Expiration date: May 31, 1986.

REFERENCE

Safety Analysis Report for Packaging (SARP) of the Oak Ridge National Laboratory TRU Californium Shipping Container, August 7, 1981 revision of Report No. ORNL-5409/R1.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

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
5754	4	USA/5754/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Fuel Services, Inc.
P.O. Box 218
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Fuel Services, Inc. application
dated November 11, 1966, as supplemented.

c. DOCKET NUMBER

71-5754

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.: RMG-172
- (2) Description

The containment vessel is a 6-inch ID by 4-1/4-inch long Schedule 40 steel pipe with a flanged and gasketed top closure. The containment vessel is centered and supported in a 16-inch ID by 21-1/4-inch long steel drum of minimum 24 gauge thickness by top and bottom stool sections.

- (3) Drawing

The container is constructed in accordance with Nuclear Fuel Services, Inc. Drawing No. RMG-172.

(b) Contents

- (1) Type and form of material

Uranium metal or compounds which will withstand a temperature of 800°C without pressure generating decomposition. The uranium may be enriched to any degree in the U-235 isotope. The contents shall be contained within two, 750 cc sealed metal cans.

Page 2 - Certificate No. 5754 - Revision No. 4 - Docket No. 71-5754

(2) Maximum quantity of material per package

Ten (10) kilograms U-235, provided the total weight of the contents does not exceed twenty (20) kilograms.

(c) Fissile Class

II

Minimum transport index to be shown on label

4.5

6. The top stool section shall be physically secured to maintain the internal spacing within the drum in the event the drum cover is lost.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: September 30, 1989.

REFERENCES

Nuclear Fuel Services, Inc. application dated November 11, 1966.

Supplement dated: October 11, 1967.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Olegarden

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 26 1984

**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
5757	3	USA/5757/B()F	1	3

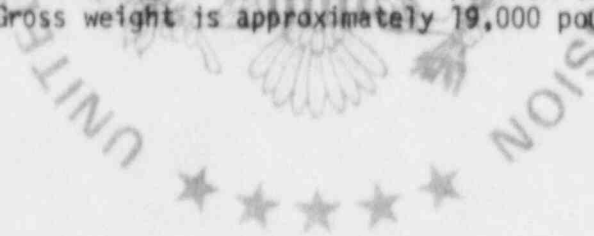
2. PREAMBLE
- a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
U.S. Department of Energy Division of Naval Reactors Washington, DC 20585	Safety Analysis Report for S5W Refueling Source shipping container dated February 14, 1968.
	c. DOCKET NUMBER 71-5757

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.: S5W Refueling Source
 - (2) Description
- The S5W Refueling Source shipping container consists of two structures, one nested within the other, having an overall envelope of 5 feet, 5 inches diameter by 9 feet, 5-5/8 inches length. The outer structure, the shipping container, is a ring of polyethylene 11-1/2 inches thick with an OD of 5 feet 4 inches and length of approximately 5 feet 2 inches. The polyethylene is canned in a 1/2-inch thick carbon steel shell. The inner structure, the replacement and installation container, fits into the cavity of the outer structure. This assembly consists of a 6-1/2 inch OD, 79-5/8 inches long stainless central tube, which is plugged at both ends by machined stainless steel forgings. Three cavities are machined in the bottom end plug to contain the neutron source assemblies. A jacket of lead, 6 inches thick, encircles the central tube and this innermost layer of shielding is to attenuate the gamma radiation. A wall of polyethylene, 8-1/2 inches thick, surrounds the lead shield and is canned with a 1/2-inch thick carbon steel plate. Gross weight is approximately 19,000 pounds.



Page 2 - Certificate No. 5757 - Revision No. 3 - Docket No. 71-5757

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 905D318, Rev. C; 905D315, Rev. F and 905D285, Rev. A.

(b) Contents

(1) Type and form of material

Neutron sources of the following type,

- (i) Polonium-Beryllium special form radioactive material neutron source. These sources may be either new or have surface contamination as a result of previous use.
- (ii) Radium-Beryllium special form radioactive material neutron source. These sources may be either new or have surface contamination as a result of previous use.
- (iii) Plutonium 238-Beryllium special form radioactive material neutron source. These sources may be either new or have surface contamination as a result of previous use.

(2) Maximum quantity of material per package

- (i) One, two, or three neutron sources as described in 5(b)(1)(i) and limited to a total content of not more than 800 curies and a combined surface contamination of not more than an A_2 quantity of radioactive material.
- (ii) One, two, or three neutron sources as described in 5(b)(1)(ii) and limited to a total content of not more than 940 curies, with radium limited to not more than 2.5 curies (gms) of this total. These sources are limited to a combined surface contamination of not more than an A_2 quantity of radioactive material.
- (iii) One, two, or three neutron sources as described in 5(b)(1)(iii) and limited to a total content of not more than 925 curies and a combined surface contamination of not more than an A_2 quantity of radioactive material.

(c) Fissile Class

I

Page 3 - Certificate No. 5757 - Revision No. 3 - Docket No. 71-5757

6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: March 31, 1988.

REFERENCES

Safety Analysis Report for S5W Refueling Source Shipping Container, WAPD-OP(R)S-2473 dated February 14, 1968.

Supplement: Bettis Atomic Power Laboratory letter WAPD-OP(R)C-474 dated December 22, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER 5758	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/5758/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for S5W Core Barrel
Disposal Cask shipping container dated
February 23, 1968.

c. DOCKET NUMBER 71-5758

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.: S5W Core Barrel Disposal Cask

(2) Description

The container is an upright cylinder 139 inches high, 58-inch inside diameter and 111-inch outside diameter. The inner shell is either 3/16 inch corrugated plate or 1/2-inch carbon steel plate, and the outer shell is 1/2-inch carbon steel plate mounted on a 1-inch base plate. Shielding consists of 26-inch thick reinforced, high density concrete around the inner shell and on the bottom, and 15 inches of carbon steel plating on the top. A 1-inch cover plate is welded on the top to seal the container. The container has a protective cover around the relief valve of 3/4-inch thick plate. Gross weight is approximately 180,000 pounds.

(3) Drawing

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. 926J485.

Page 2 - Certificate No. 5758 - Revision No. 2 - Docket No. 71-5758

(b) Contents

(1) Type and form of material

An irradiated S5W core barrel which meets the requirements of special form material, with between 2 and 10 gallons of water and surface contamination in the form of activated corrosion product.

(2) Maximum quantity of material per package

One irradiated assembly as described in 5(b)(1). Surface contamination shall not exceed 3.2 curies of radioactive material. The special form material shall not exceed 100,000 curies. Shipment shall not be made prior to 30 days after reactor shutdown.

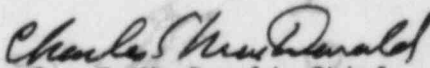
6. Expiration date: March 31, 1988.

REFERENCES

Safety Analysis Report for the S5W Core Barrel Disposal Cask shipping container, WAPD-OP(R)SA-724, dated February 23, 1968.

Supplements: Naval Reactors Memorandum G #1363; dated June 19, 1968, G #1462; dated August 12, 1968 and G #4470; dated December 12, 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5768	7	USA/5768/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Babcock & Wilcox Company
609 N. Warren Avenue
Apollo, PA 15613

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Babcock & Wilcox Company application
dated January 29, 1982, as supplemented.

c. DOCKET NUMBER

71-5768

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

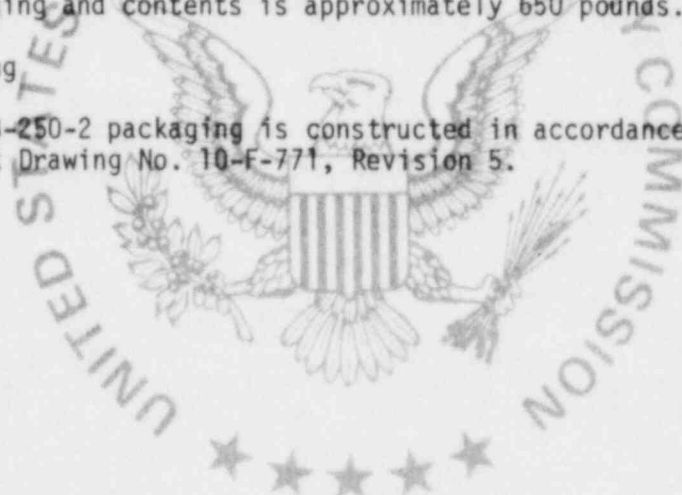
(1) Model No.: BB-250-2

(2) Description

Inner container is 11-1/2" ID, 16-gage steel cylinder, 63-1/2" long, with bolted and gasketed top flange closure and seal welded bottom plate. Inner container is centered and supported in a 22-1/2" ID by minimum 74" long, 16-gage steel drum by 1/4" diameter spring steel rods and vermiculite. The outer cover is secured by either a 12-gage closure ring or six (6), 1/2" diameter bolts. Maximum weight of packaging and contents is approximately 650 pounds.

(3) Drawing

The BB-250-2 packaging is constructed in accordance with Babcock & Wilcox Drawing No. 10-F-771, Revision 5.



Page 2 - Certificate No. 5768 - Revision No. 7 - Docket No. 71-5768

(b) Contents

(1) Type and form of material

- (i) Uranium oxide enriched to a maximum 4.0 w/o in the U-235 isotope. Chemically-bound or physically-bound water in mixtures is permitted. Slips or slurries that exhibit a visually discernible liquid second phase are prohibited.
- (ii) Bulk uranium oxide (UO_2 or U_3O_8) powder with a maximum density of 2 g U/cc and enriched to a maximum 5.0 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the inner container shall not exceed 1.13.
- (iii) Uranium compounds which will not decompose at temperatures up to 750°F. Uranium may be enriched to a maximum 5.0 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the inner container shall not exceed 1.5.
- (iv) Uranium oxide pellets, enriched to a maximum of 4.0 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the inner container, shall not exceed 3.0.

(2) Maximum quantity of material per package

- (i) For the contents described in 5(b)(1)(i):

Total contents not to exceed 200 pounds, with the U-235 content not to exceed 2.95 kg. The contents shall be contained within two (2), 9-3/4 inch diameter by 12 inch high sealed stainless steel cans. Empty stainless steel cans will be used to make up the remaining space within the inner container.

- (ii) For the contents described in 5(b)(1)(ii):

Total contents not to exceed 315 pounds, with the U-235 content not to exceed 6.25 kilograms. The contents shall be contained within 9-3/4-inch diameter by 12-inch high metal containers. Empty metal cans will be used to make up the remaining space within the inner container.

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(iii) For the contents described in 5(b)(1)(iii)

Total contents not to exceed 250 pounds, with the U-235 content not to exceed 5.0 kilograms. Four (4) steel drums containing not more than 1.3 kilograms U-235 each shall be packaged in the shipping insert within the inner container as shown in Westinghouse Electric Corporation Sketch SKA-252-1 and Drawing No. C7108D10. The steel drums shall be constructed in accordance with U.S. Military Standard MS 24347 with a maximum ID of 8.5" and a nominal height of 15.4".

(iv) For the contents described in 5(b)(1)(iv):

Total contents not to exceed 250 pounds, with the U-235 content not to exceed 4.0 kilograms. The contents shall be transported in 9-3/4-inch diameter metal containers. Empty metal containers will be used to make up the remaining space within the inner container.

(c) Fissile Class

II and III

(1) Minimum transport index to be shown on label for Fissile Class II.

(i) For the contents described in 5(b)(1)(i): 3.6

(ii) For the contents described in 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv): 0.5

(2) Maximum number of packages per shipment for Fissile Class III

(i) For the contents described in 5(b)(1)(i): 30

(ii) For the contents described in 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(2)(iv): 200

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

7. Expiration date: September 30, 1987.

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REFERENCES

Babcock & Wilcox Company application dated January 29, 1982.

Supplements dated: August 6 and 20, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
5787	1	USA/5787/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, TN 37830

Safety Analysis Report for Packaging (SARP) of the
Oak Ridge National Laboratory Shipping Cask D-38
Report ORNL-5406, Rev. 1, August 7, 1981.

c. DOCKET NUMBER 71-5787

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.: D-38

(2) Description

Packaging for fissile and large quantities of radioactive material contained in special form encapsulation. Plutonium is doubly contained. The inner cavity of the cask is a 300 Series stainless steel Schedule 40 pipe with inside dimensions 6-1/16 inches in diameter x 13-13/16 inches high. The outer shell is a 300 Series stainless steel Schedule 30 pipe 20-1/2 inches high. Shielding consists of depleted uranium metal with a thickness of 2-3/4 inches. The top opening plug is held in place by eighteen, 1/2-inch studs equipped with nuts. The plug is sealed with a Neoprene gasket. The cask is mounted on a 14-inch square x 5/8-inch thick base plate. Six of the studs are extra long so that a protective shroud may be used during transport. The cask is bolted with four, 1-inch bolts to a 3-foot square pallet. The package gross weight is 1,525 pounds.

(3) Drawings

The cask is constructed in accordance with Union Carbide Corporation, Nuclear Division, Oak Ridge National Laboratory Drawing Nos. M-12133-CD-126E Rev. 12 and M-12166-CD-022 Rev. 1.

Page 2 - Certificate No. 5787 - Revision No. 1 - Docket No. 71-5787

5. (b) Contents

(1) Type and form of material

- (i) Solid radioactive material including U-235 encapsulated to meet the requirements of special form radioactive material.
- (ii) Solid radioactive material including U-233 and Pu-239 encapsulated to meet the requirements of special form radioactive material; plutonium bearing solid must have a second special form radioactive material encapsulation.

(2) Maximum quantity of material per package

The maximum internal heat not to exceed 80 watts;

- (i) For the material described in 5(b)(1)(i) the mass of U-235 not to exceed 500 g.
- (ii) For the material described in 5(b)(1)(ii) the mass of U-233 or Pu-239 not to exceed 350 g.
- (iii) For any combination of the materials described in 5(b)(1)(i) and 5(b)(1)(ii) the total combined mass of U-235, U-233, and Pu-239 not to exceed 350 g.

(c) Fissile Class

- 6. Special form capsule may be held within DOT Specification 2R containers within the cask cavity.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: July 31, 1987.

REFERENCE

Oak Ridge National Laboratory Report No. ORNL-5406, Rev. 1, August 7, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

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
5796	9	USA/5796/B()	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Advanced Medical Systems, Inc.
1020 London Road
Cleveland, OH 44110

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Advanced Medical Systems, Inc. application
dated February 26, 1982, as supplemented.

71-5796

c. DOCKET NUMBER

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 Nos.: 181375 and 181361

(2) Description

Overpacks that provide impact and thermal protection for teletherapy head assemblies or source exchange assemblies. The cubical overpacks consist of laminated 2 x 4 hardwood maple panels bolted together and covered with 16 gauge steel panels. Reinforcing steel straps and angles are welded together and spaced to limit the openings between them to less than 6 inches. Skid runners are provided to facilitate fork lift usage. Dimensions of the Model No. 181375 are 43.5"L x 39.75"W x 41"H with a maximum gross weight of 3,750 pounds. Dimensions of the Model No. 181361 are 39"L x 34.25"W x 44.5"H with a maximum gross weight of 4,000 pounds.

(3) Drawings

(1) The Model No. 181375 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos. as specified in Section 1.3.1 (p 1-8) of the application.

(2) The Model No. 181361 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos. as specified in Section 1.3.2 (p 1-9) of the application.

Page 2 - Certificate No. 5796 - Revision No. 9 - Docket No. 71-5796

5. (b) Contents

(1) Type and form of material

- (i) Cobalt 60 sealed sources that meet the requirements of special form radioactive material; or
- (ii) Cesium 137 in the form of cesium chloride encapsulated in sealed sources that meet the requirements of special form radioactive material or in sealed sources constructed and inspected in accordance with Picker Corporation letter dated January 4, 1980.

(2) Maximum quantity of material per package

- (i) 13,680 curies of cobalt 60 with a radioactive decay heat load not to exceed 200 watts; or
- (ii) 2,200 curies of cesium 137 with a radioactive decay heat load not to exceed 17 watts.

6. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.

7. Expiration date: July 31, 1987.

REFERENCES

Advanced Medical Systems, Inc. application dated February 26, 1982.

Supplement dated: May 18, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: MAR 22 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 5797	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/5797/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
P.O. Box E
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Packaging: The
ORNL HFIR Unirradiated Fuel Element Shipping
Containers, ORNL/ENG/TM-9, November 1977, as
amended.

71-5797

DOCKET NUMBER

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 Nos.:

Inner HFIR Unirradiated Fuel Element Shipping Container, and Outer HFIR Unirradiated Fuel Element Shipping Container

(2) Description

Packaging for unirradiated fissile radioactive material as fuel elements for the High Flux Isotope Reactor (HFIR). The container is a right circular cylinder with an 11-gauge carbon steel shell. Closure is provided by 16, 3/8-inch diameter steel bolts which attach the lid to the cylindrical steel shell. The steel shell is filled with laminated Douglas fir plywood with a minimum thickness of 6 inches. A central cavity is formed in the plywood, and lined with a 1-inch thickness of polyethylene foam.

The packaging for the inner HFIR fuel element has overall dimensions of 25-inch OD by 45-inch high, a 10-7/8-inch diameter by 30-1/4-inch deep cavity, and a 660 pound gross weight.

The packaging for the outer HFIR fuel element has overall dimensions of 31.5-inch OD x 45.75-inch high, a 17-3/8-inch diameter by 31-1/8-inch deep cavity, and a 1,050 pound gross weight.

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5. (a) Packaging (Cont'd)

(3) Drawings

- (i) The packaging for the inner HFIR fuel is constructed in accordance with Oak Ridge National Laboratory Drawing No. M-20978-EL-003, Rev. 6.
- (ii) The packaging for the outer HFIR fuel is constructed in accordance with Oak Ridge National Laboratory Drawing No. M-20978-EL-002, Rev. 6.

(b) Contents

(1) Type and form of material

Uranium as U_3O_8 -Al cermet, enriched upto 93% in the U-235 isotope, and clad in aluminum, 10-mils thick, and:

- (i) For the packaging described in 5(a)(3)(i) the contents are described in Oak Ridge National Laboratory Drawing No. D-42118, Rev. J.
- (ii) For the packaging described in 5(a)(3)(ii) the contents are described in Oak Ridge National Laboratory Drawing No. D-42126, Rev. G.

(2) Maximum quantity of material per package

- (i) For the contents described in 5(b)(1)(i) not more than 2.7 kg of U-235.
- (ii) For the contents described in 5(b)(1)(ii) not more than 6.9 kg of U-235.

(c) Fissile Class

I

- 6. Prior to delivery to a carrier for transport, the shipper shall ensure that at no point along the proposed shipping route that the ambient temperature will be less than 32°F; or, the shipment shall be made in a heated vehicle such that the package temperature shall not be less than 32°F along the shipping route.
- 7. The package authorized by this certificate is hereby approved for use under general license provisions of 10 CFR §71.12.
- 8. Expiration date: October 31, 1989.

Page 3 - Certificate No. 5797 - Revision No. 4 - Docket No. 71-5797

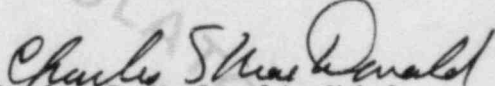
REFERENCES

Oak Ridge National Laboratory Report No. ORNL/ENG/TM-9, Nov. 1977.

Supplements dated: July 31, 1978; and September 17, 1979.

Department of Energy supplement dated: December 14, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 23 1984

**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
5805	13	USA/5805/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc. application
dated April 29, 1982, as supplemented.

71-5805

c. DOCKET NUMBER

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.: CNS 3-55
- (2) Description

The package is a steel-encased, lead-shielded cask with crushable impact limiters. The basic cask is a steel cylinder 133-3/4 inches long by 50-1/2 inches in diameter with maximum cavity dimensions of 36 inches in diameter by 116 inches long reduced to 111 inches by the shield ring attached to the lid cover. Shielding is provided by 6 inches of chemical lead in the sides and closure base plate and 5-1/4 inches in the closed end.

The outside steel encasement is made up of two, 1/2-inch plates on the sides and three plates totaling 2-5/8 inches on the end. The containment vessel is a 1/4-inch thick cylinder with a 1/2-inch end plate. The shells are welded together with the lead shielding poured to fill the annular and end spaces.

The removable, flanged and recessed base plate weldment consists of 3/8-inch and 1-1/4-inch outside plates and a 5/8-inch inside plate. The space between the plates is lead-filled.

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5. (a) Packaging (continued)

(2) Description (continued)

The base plate is secured to the cask body by means of twelve, 1-1/2-inch high strength bolts and nuts and sealed with two silicone O-rings.

The cavity is penetrated by a vent line at the closed end and a drain line through the base plate. The vent line is sealed by a gasketed and shielded plug. The drain line is sealed with a 25 psig relief valve.

Cask appendages include two, 8-inch lifting trunnions and two, 4-inch removable tilting trunnions on the cask side.

Removable impact limiters are provided at the cask ends and at the two, 8-inch trunnions. The former consist of a series of 6-inch diameter closed end tubes. Each impact limiter has tubes approximately 6 inches long around the end periphery. The closure end impact limiter has 12 tubes, six about 6 inches long and six about two inches long, around the sides. The closed end impact limiter has six tubes about 6 inches long around the sides. A gusseted tube acts as the trunnion impact limiter.

The cask is secured horizontally to a skid which is mounted to the transport vehicle for shipment. A sunshade is provided.

The gross weight of the package, excluding the skid and sunshade is approximately 70,000 pounds. The skid weighs about 4,200 pounds.

(3) Drawings

The packaging is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing Nos.: MOD 100, Rev. J; C-111-D-0001, Rev. 0; and C-111-E-0002, Rev. 0; and ATCOR Drawing Nos.: MOD 139-1, Rev. K; MOD 140, Rev. C; MOD 124, Rev. D; 0999-D-07, Rev. G; 0999-C-08, Rev. G; and 1000-D-0024-0, Rev. 0.

(b) Contents

(1) Type and form of material

Irradiated metal components packaged in secondary containers.

(2) Maximum quantity of material per package

Package internal decay heat load not to exceed 250 watts.

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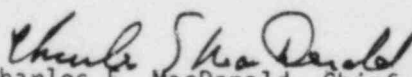
6. (a) Both the inner cask cavity and the secondary container must be free of water when the package is delivered to a carrier for transport.
 - (b) Except for close fitting items, shoring must be placed between contents, secondary container and cask cavity to minimize secondary impacts due to accident sequence.
 - (c) The maximum gross weight of the contents, secondary container and shoring is limited to 9,220 pounds.
7. Prior to each shipment, the silicone O-ring seals (base plate and vent plug) must be inspected, the seals must be replaced with new seals if inspection shows any defects or every six (6) months, whichever occurs first.
 8. Prior to delivery of the package to a carrier for transport, the package containment cavity shall be leak tested. The sensitivity of the test shall be at least 1×10^{-1} atm cm³/sec (STP).
The packaging containment cavity shall be leak tested initially and at least once every twelve (12) months. The sensitivity of the test shall be at least 1×10^{-3} atm cm³/sec (STP).
 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12. Fabrication of additional packagings after December 31, 1983 is not authorized.
 10. Expiration date: December 31, 1988.

REFERENCES

Chem-Nuclear Systems, Inc. application dated April 29, 1982.

Supplements dated: October 21 and November 16, 1983; and June 12, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 13 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5814	2	USA/5814/B()F	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis for Radioactive Material
Shipping Cask NRBK-41, 42 and 43 dated
March 11, 1968 as supplemented.

c. DOCKET NUMBER 71-5814

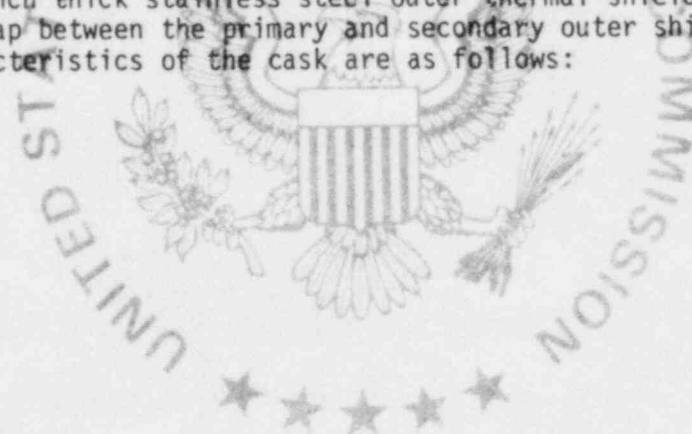
4. CONDITIONS

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 Nos.: NRBK-41 NRBK-42 and NRBK-43
- (2) Description

Top loading cylindrical lead shielded 304L stainless steel clad casks for the shipment of irradiated test specimens. Casks have a one-inch thick stainless steel plate integral skid welded to the body. In addition, they have bolted on, all welded, 48-inch square "I" beam skids utilized to distribute the cask load. The cavity of the casks are formed by 1/4-inch thick stainless steel surrounded by poured lead shielding with a 1/2-inch thick stainless steel cylindrical sheet outer shell. In addition Model No. NRBK-43 cask has a seal welded 1/4-inch thick stainless steel outer thermal shield with a 1/16-inch air gap between the primary and secondary outer shield. The physical characteristics of the cask are as follows:



Page 2 - Certificate No. 5814 - Revision No. 2 - Docket No. 71-5814

5. (a)(2) Description (continued)

<u>Model No.</u>	<u>NRBK-41</u>	<u>NRBK-42</u>	<u>NRBK-43</u>
<u>Outer Dimensions</u>			
Diameter, in	26.5	21.5	21.5
Height, in	39	24	41
<u>Cavity Dimensions</u>			
Diameter, in	5	8	8
Length, in	16	9	27
<u>Approx. Loaded Weight, lbs</u>	9,000	3,500	6,000
<u>Lead Shielding Thickness, in</u>	10	6	6
<u>Reference Drawings Nos.</u> (Battelle Memorial Institute)	41-0001, Sh.1, Rev. A and Sh. 2, Rev. B, of 2.	42-0001, Sh.1, Rev. A and Sh. 2, Rev. C, of 2.	43-0001, Sh. 1, Rev. B and Sh. 2, Rev. A, of 2.

5. (a)(3) Product Containers

The contents of the package must be packaged in inner product containers. The inner product containers are constructed in accordance with the following Westinghouse Electric Corporation Drawing Nos.:

<u>Product Container</u>	<u>Drawing Nos.</u>
IN-41	971D207, Rev. 3 and 971D201, Rev. 4
IN-42	971D207, Rev. 3 and 971D201, Rev. 4
IN-43	971D207, Rev. 3 and 971D201, Rev. 4
IN-43 Melba	954F098, Rev. 4 and 904E122, Rev. 2
PR	979C200, Rev. 2
PS	979C106, Rev. 2
WPS	979C140, Rev. 2
T	979C145, Rev. 2
ZT	979C143, Rev. 3
Z	979C155, Rev. 1
ZZ	979C144, Rev. 1

Page 3 - Certificate No. 5814 - Revision No. 2 - Docket No. 71-5814

5. (b) Contents

(1) Type and form of material

Byproduct and special nuclear material contained within product containers listed below. The contents shall be dry and unmoderated (H to X atomic ratio 2) unless specifically authorized for the product container.

<u>Model No.</u>	<u>Product Container Nos.</u>
NRBK-41	IN-41, PR, PS, WPS, T, ZT, Z, and ZZ
NRBK-42	IN-42 and PR
NRBK-43	IN-43, IN-43-Melba, PR, PS, WPS, T, ZT, Z, and ZZ

(2) Maximum quantity of material per package

The fissile contents of the cask shall be limited to a maximum of 350 equivalent grams of U-235. The number of equivalent grams of U-235 is determined by the equation: $1.0 \times \text{grams U-235} + 1.4 \times \text{grams U-233} + 1.6 \times \text{grams plutonium}$. The maximum decay heat load per package shall not exceed those listed below.

<u>Model No.</u>	<u>Maximum Decay Heat Load</u>
NRBK-41	8400 Btu/HR
NRBK-42	2100 Btu/Hr
NRBK-43	7500 Btu/Hr

(c) Fissile Class

II

Minimum transport index to be shown on label

3.2

6. The "IN-41" product container may also be used to ship NaK filled capsules provided the following specifications and restrictions are met.

- (i) The NaK filled capsules shall be placed into a steel or stainless steel container with walls at least 1/4-inch thick, a welded closure on one end and a pipe cap on the other end.
- (ii) The NaK filled capsules shall fit within the container with a maximum play of 1/2 inch in any direction. Inner fixtures may be used to provide the indicated degree of snugness. The capsules and container must be thoroughly dry prior to loading.

CONDITIONS (continued)

Page 4 - Certificate No. 5814 - Revision No. 2 - Docket No. 71-5814

- (iii) Suitable pipe sealing compound shall be placed on the threads of the container top closure prior to tightening the closure.
- (iv) The sealed container shall be placed into an "IN-41" product container with a maximum play of 1/2 inch in any direction. Inner fixtures may be used to provide the indicated degree of snugness. Both containers must be thoroughly dry prior to loading.
- (v) The maximum volume of NaK in the NRBK-41 cask and associated inner container shall be 50 cc.

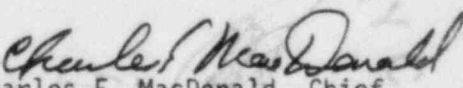
7. Expiration date: April 30, 1985.

REFERENCES

Safety Analysis for Radiative Material Shipping Cask No. NRBK-41, 42 and 43 dated March 11, 1968.

Supplements: Division of Naval Reactors letters S# 1458; dated June 19, 1968, S# 1570; dated September 19, 1968, S# 1597; dated September 19, 1968, S# 1658; dated October 22, 1968, S# 1681; dated November 7, 1968, S# 1690; dated November 22, 1968, S# 1903; dated March 19, 1969, S# 2000; dated June 2, 1969 and S# 2509; dated June 10, 1970 and Bettis Atomic Power Laboratory letter WAPD-CL(IH)-733, dated October 10, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5828	3	USA/5828/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Los Alamos Scientific Laboratory
University of California
Los Alamos, NM 87545

"Safety Analysis Report for the TREAT Capsule
Assembly Shipping Container," Report No.
LA-6606-MS, December 1976.

c. DOCKET NUMBER

71-5828

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.: TREAT

(2) Description

Packaging for TREAT capsule assemblies. The inner container is a 1-inch thick plywood box; covered with 14-gage steel sheet; with an interior "T" beam; and 0.020-inch cadmium lining on the top, bottom, and on each side of the central divider; and a hinged cover. An outer container consists of two cylindrical metal tubes, separated by 3 inches of phenolic foam, and a support assembly for the inner container. The outer container is held within a metal truss framework. The package gross weight is 1,800 lbs.

(3) Drawings

The packaging is as shown in Figures 2, 4, 5 and 6 of Los Alamos Report No. LA-6606-MS, December 1976.

Page 2 - Certificate No. 5828 - Revision No. 3 - Docket No. 71-5828

5. (b) Contents

(1) Type and form of material

(i) Fast reactor fuel pin contains plutonium which is hermetically sealed in 316 stainless steel thin wall tube which is further encapsulated in a 1.125 OD, 316 stainless steel with welded or brazed end caps and contained within a 3-inch OD by 1/4-inch thick wall steel pipe. The capsule assembly is as shown in Figures 1 and 3 of Los Alamos Report No. LA-6606-MS, December 1976; or

(ii) Unirradiated ORNL-ORR shim rod assembly containing uranium enriched U-235 isotope within aluminum plates.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i):

Not more than two (2) fast reactor fuel pins. Fissile material not to exceed 60 grams per cm over package length. Total plutonium or other fissile material not to exceed 2.1 kg.

(ii) For the contents described in 5(b)(1)(ii):

Not more than two (2) assemblies. Fissile material not to exceed 7 grams per cm over package length. Total U-235 not to exceed 350 grams.

(c) Fissile Class I

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

7. Expiration date: October 31, 1987.

REFERENCES

"Safety Analysis Report for the TREAT Capsule Assembly Shipping Container," Los Alamos Scientific Laboratory Report No. LA-6606-MS, December 1976.

Department of Energy, HQ supplement dated: April 7, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5830	3	USA/5830/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Department of the Navy
Naval Support Force Antarctica
FPO San Francisco, CA 96601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Minnesota Mining and Manufacturing Company
application dated June 28, 1968.

c. DOCKET NUMBER 71-5830

4. CONDITIONS

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

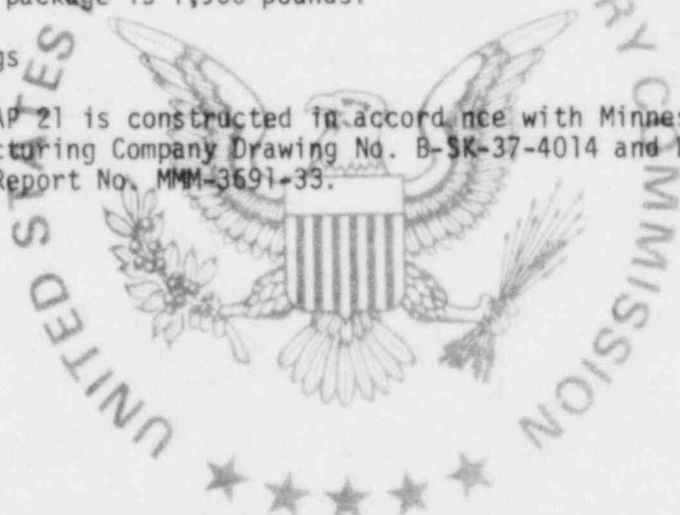
5. (a) Packaging

- (1) Model No.: SNAP 21
- (2) Description

A thermoelectric generator 16 inches in diameter by 30 inches long packaged in a right circular metal protective enclosure 52 inches in diameter by 68 inches high. Main components of the generator consist of an outer Beryllco-165 housing with flange; U-8 Mo shielding; thermal insulation; thermoelectric modules; and the heat source. Total weight of the package is 1,900 pounds.

(3) Drawings

The SNAP 21 is constructed in accordance with Minnesota Mining and Manufacturing Company Drawing No. B-SK-37-4014 and Drawings included in 3M Report No. MMM-3691-33.



Page 2 - Certificate No. 5830 - Revision No. 3 - Docket No. 71-5830

5. (b) Contents

(1) Type and form of material

Strontium 90 titanate pellets doubly encapsulated by a thin inner liner and a 0.2-inch thick Hastelloy C primary containment capsule which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

33,000 ci

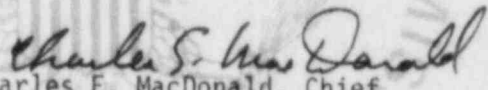
6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

7. Expiration date: July 31, 1985.

REFERENCE

Minnesota Mining and Manufacturing Company application dated June 28, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5862	3	USA/5862/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Teledyne Energy Systems
110 West Timonium Road
Timonium, MD 21093

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Isotopes, Inc. application dated August 10,
1971, as supplemented.

71-5862

c. DOCKET NUMBER

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.: Sentinel-100F
- (2) Description

The package, a thermoelectric generator, is 45.5 inches in height with a base diameter of 24.5 inches (excluding mounting pads), and weighs approximately 2,600 pounds. The components include a Tungsten biological shield (10.705" x 13.837" OD) which is within the aluminum (6061) outer protective housing. Four 6061-T6 mounting pads at the base of the aluminum housing provide the shipping pallet attachment points.

(3) Drawings

The packaging is constructed in accordance with the following Isotopes, Inc. Drawing Nos.:

010F10000 Sheets 1-3 (Rev. A), Generator Assembly Sentinel 100F
010-20000 Fuel Capsule Assembly
010-70003 Shield Body
010-70004 Shield Plug
001-90064 Sheets 1-2, Shipping Crate Sentinel RTG
001-90039 Sheets 1-4, Pallet Assembly

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5. (b) Contents

(1) Type and form of material

Strontium 90 titanate doubly encapsulated in a stainless steel liner and Hastelloy or Uniloy HC capsule which meet the requirements of special radioactive material.

(2) Maximum quantity of material per package

370,000 curies.

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

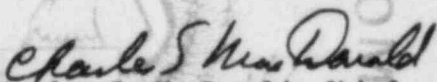
7. Expiration date: July 31, 1985.

REFERENCES

Isotopes, Inc., application dated August 10, 1971.

Supplements dated: September 24, October 22, November 30, and December 20, 1971; and January 19, 1972.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

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
5874	2	USA/5874/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
U.S. Department of Energy Division of Naval Reactors Washington, DC 20585	Safety Analysis for Radioactive Material Shipping Cask No. WAPD-40 dated March 11, 1968, as supplemented.
	c. DOCKET NUMBER 71-5874

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.: WAPD-40
- (2) Description

End or top loading cylindrical, 10 inch lead shielded, 304L stainless steel clad cask for the shipment of irradiated test specimens. Cask has integral skid welded to the body. Cylindrical cavity is 1/4 inch thick 304L stainless steel tube with 2 inches bore by 135.25 inches length. There are stainless steel clad 10 inch thick lead shielded plugs bolted to each end. Each lid weighs 100 pounds. Overall size of the cask is 24 inches in diameter x 168 inch skid length. Gross weight with skid is 27,100 pounds. Using the four lifting trunnions as tiedowns to a truck is forbidden; hence, a special holddown cradle is used during truck shipments. This cradle weighs approximately 5000 pounds.

(3) Drawings

The WAPD-40 cask was originally fabricated in accordance with Westinghouse Assembly Drawing No. 936F577, Rev. 4, and later modified in accordance with Battelle Memorial Institute Drawing No. 100-E, Rev. 0.

Page 2 - Certificate No. 5874 - Revision No. 2 - Docket No. 71-5874

5. (a) (4) Product Containers

The contents of the package must be packaged in inner product containers. The inner product containers are constructed in accordance with the following Westinghouse Electric Corporation Drawing Nos.:

<u>Product Container</u>	<u>Drawing Nos.</u>
IN-40	979C282, Rev. 1 and 971D362, Rev. 1
LRS	979C194, Rev. 2
LLR	979C277, Rev. 3

(b) Contents

(1) Type and form of material

Byproduct and special nuclear material contained within product containers. The contents shall be dry and unmoderated (H to X atomic ratio <2).

(2) Maximum quantity of material per package

The fissile content of the cask shall be limited to a maximum of 350 equivalent grams of U-235. The number of equivalent grams of U-235 is determined by the equation: $1.0 \times \text{grams U-235} + 1.4 \times \text{grams U-233} + 1.6 \times \text{grams plutonium}$.

(c) Fissile Class

II

Minimum transport index to be shown on label 3.2

6. Maximum decay heat per package shall not exceed 8,400 BTU/hr.

7. Expiration date: April 30, 1985.

CONDITIONS (continued)

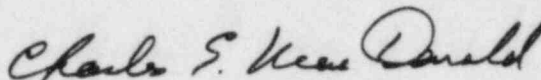
Page 3 - Certificate No. 5874 - Revision No. 2 - Docket No. 71-5874

REFERENCES

Safety Analysis for Radioactive Material Shipping Cask No. NRBK-40 dated March 11, 1968.

Supplements: Division of Naval Reactors letters S#1387; dated May 14, 1968, S#1570; dated September 19, 1968, S#1597; dated September 19, 1968, S#1658; dated October 22, 1968, S#1681; dated November 7, 1968, S#1690; dated November 22, 1968, and S#1903; dated March 19, 1969 and Bettis Atomic Power Laboratory letter WAPD-CL(IH)-733 dated October 10, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonal, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a CERTIFICATE NUMBER 5875	b REVISION NUMBER 2	c PACKAGE IDENTIFICATION NUMBER USA/5875/B()F	d PAGE NUMBER 1	e TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis for Radioactive Material Shipping
Cask WAPD-39 and NRBK-44 dated March 11, 1968
and August 15, 1968 as supplemented.

c. DOCKET NUMBER

71-5875

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 Nos.: WAPD-39 and NRBK-44
- (2) Description

The WAPD-39 cask and the NRBK-44 cask are physically nearly identical and they are functionally identical. The casks are top loading cylindrical lead shielded 304L stainless steel clad casks used for shipment of irradiated test specimens. The cavity of the casks are formed by 1/4-inch thick stainless steel surrounded by 10 inches of poured lead shielding with a 1/2-inch thick stainless steel cylindrical sheet outer shell. The casks are shipped in a horizontal position on a steel "I" beam skid which is equipped with four combination tiedown-swivel trunnion blocks. The physical characteristics are as follows:

<u>Model No.</u>	<u>WAPD-39</u>	<u>NRBK-44</u>
<u>Outer Dimensions</u>		
Diameter, in	26.75	26.75
Height, in	75	75

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5. (a) (2) Description (continued)

<u>Model No.</u>	<u>WAPD-39</u>	<u>NRBK-44</u>
<u>Cavity Dimensions</u>		
Diameter, in	5	5
Length, in	50	50
<u>Approx. Loaded Weight, lbs</u>	16,500	16,500
<u>Lead Shielding Thickness, in</u>	10	10
<u>Reference Drawing Nos.</u> (Battelle Memorial Institute)	39-100, Sh. 1, Rev. 0, Sh. 2, Rev. 0 and Sh.3, Rev. 0, of 3	41-0001, Sh. 1, Rev. 0 and Sh. 2, Rev. 0, of 2

5. (a) (3) Product Containers

The contents of the package must be packaged in inner product containers. The inner product containers are constructed in accordance with the following Westinghouse Electric Corporation Drawing Nos., except where noted:

<u>Product Container</u>	<u>Drawing Nos.</u>
IN-39	971D207, Rev. 3 and 971D201, Rev. 4
PR	979C200, Rev. 2
PS	979C106, Rev. 2
WPS	979C140, Rev. 2
T	979C145, Rev. 2
ZT	979C143, Rev. 3
Z	979C155, Rev. 1
ZZ	979C144, Rev. 1
HW (or Hoke)	1801, Rev. D (Hoke Corporation Drawing) and 272E526, Rev. A (General Electric Company Drawing)
C7	965D391, Rev. 2
ZC7	965D391, Rev. 2

5. (b) Contents

(1) Type and form of material

Byproduct and special nuclear material contained within product containers. The contents shall be dry and unmoderated (H to X atomic ratio ≤ 2) unless specifically authorized for the product container.

(2) Maximum quantity of material per package

(i) The fissile content of the cask shall be limited to a maximum of 350 equivalent grams of U-235. The number of equivalent grams of U-235 is determined by the equation: $1 \times \text{grams U-235} + 1.4 \times \text{grams U-233} + 1.6 \times \text{grams plutonium}$.

(ii) Up to six, C7B3 or C7B3A Irradiation Test Oxide Rods in inner container "C7" and "ZC7". If less than six C-7 rods are to be shipped, other fissile materials may be included in the "C7" or "ZC7" inner containers. There can be up to 509 equivalent grams of U-235 in each C-7 rod, for a shipment total of 3054 equivalent grams of U-235. The number of equivalent grams of U-235 is determined by the equation: $1.0 \times \text{grams U-235} + 1.4 \times \text{grams U-233} + 1.6 \times \text{grams plutonium}$. If less than six "C7" rods are to be shipped, 175 equivalent grams of U-235 may be placed in each of the "C7" and "ZC7" inner containers which would be otherwise empty. Each such shipment must contain six, "C7" or "ZC7" sealed inner containers within the split aluminum envelope even though one or more of the inner containers may be empty.

(c) Fissile Class

II

- | | | |
|--|---|-----|
| (1) Minimum transport index to be shown on label | For the contents described in 5(b)(1) and limited in 5(b)(2)(i): | 3.2 |
| (2) Minimum transport index to be shown on label | For the contents described in 5(b)(1) and limited in 5(b)(2)(ii): | 10 |

CONDITIONS (continued)

Page 4 - Certificate No. 5875 - Revision No. 2 - Docket No. 71-5875

6. Maximum day heat per package shall not exceed 8,400 Btu/hr.
7. The "HW" product container may be used to ship test specimens containing small quantities of water and pressurized gas. The total internal pressure of the product container shall not exceed 1,050 psi at a uniform temperature of 400°F.
8. Expiration date: April 30, 1985.

REFERENCES

Safety Analysis for Radioactive Material Shipping Cask WAPD-39 and NRBK-44 dated March 11, 1968 and August 15, 1968.

Supplements: Division of Naval Reactors letters S# 1387; dated May 14, 1968, S# 1638; dated October 17, 1968, S# 1570; dated September 19, 1968, S# 1597; dated September 19, 1968, S# 1658; dated October 22, 1968, S# 1681; November 7, 1968, S# 1690; dated November 22, 1968, and S# 1903; dated March 19, 1969 and Bettis Atomic Power Laboratory letter WAPD-CL(IH)-733 dated October 10, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5894	3	USA/5894/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for 2.7 New Fuel
Shipping Container dated July 15, 1968,
as supplemented.

c. DOCKET NUMBER

71-5894

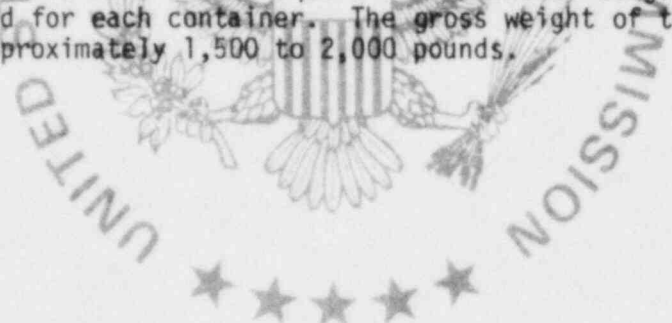
4. CONDITIONS

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.: 2.7 New Fuel
- (2) Description

The Model No. 2.7 New Fuel container was designed to ship and store new and unirradiated S5W Core R2 fuel modules. Adapters are used to permit additional shipments of S5W Core R3, A1W Core R2, and SIC Type I fuel modules. The container assembly consists of two major components, an inner container which holds the fuel module and an outer container which supports the inner container. The steel outer container is approximately 24.5 inches wide by 24.5 inches high and 128 inches long. The cross section of the outer container is octagonal, the steel shell thickness is 0.1875 inch, ASTM-A283 Gr. B. The outer shell is surrounded by a framework of steel stiffeners and rails. The inner container is constructed from Type 304 CRES plates, 0.1875 inch thick and is 7.76 inches square and 99 inches long. Bolted closure is provided for each container. The gross weight of the package ranges from approximately 1,500 to 2,000 pounds.



Page 2 - Certificate No. 5894 - Revision No. 3 - Docket No. 71-5894

(3) Drawing

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. 924J152, Rev. 16.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type:

- (i) S5W Core R2 standard module or corner module;
- (ii) S5W Core R3 standard module or corner module;
- (iii) A1W Core R2 standard cluster or half cluster;
- (iv) S1C Core Type I standard cluster;
- (v) S1C Core Type I fuel subassembly;
- (vi) S5W Core 2 standard module or corner module;
- (vii) A1W Core R2 subassembly.

(2) Maximum quantity of material per package

- (i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv) or 5(b)(1)(vi).
- (ii) Two fuel assemblies as described in 5(b)(1)(v).
- (iii) Four fuel assemblies as described in 5(b)(1)(vii).

(c) Fissile Class

III

Maximum number of packages per shipment:

- (1) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iv), 5(b)(1)(v), and 5(b)(1)(vi) and limited in 5(b)(2)(i) and 5(b)(2)(ii): No more than one total core's worth
- (2) For the contents described in 5(b)(1)(iii) and 5(b)(1)(vii) and limited in 5(b)(2)(i) and 5(b)(2)(iii): 25 total, with the number of packages as described in 5(b)(1)(vii) and limited in 5(b)(2)(iii) not to exceed four

6. Expiration date: January 31, 1988

CONDITIONS (continued)

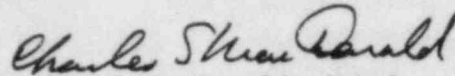
Page 3 - Certificate No. 5894 - Revision No. 3 - Docket No. 71-5894

REFERENCES

Safety Analysis Report for 2.7 New Fuel Shipping Container, WAPD-OP(R)S-2650 dated July 15, 1968.

Supplements: Bettis Atomic Power Laboratory letters WAPD-OP(R)S-2800 dated September 3, 1968 and WAPD-OP(R)S-3425 dated August 14, 1969, and Department of Energy letter G# 6291 dated July 13, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
5908	10	USA/5908/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Babcock & Wilcox Company
609 N. Warren Avenue
Apollo, PA 15613

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Materials and Equipment Corporation
application dated May 3, 1974, as supplemented.

c. DOCKE JMBER

71-5908

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.: DOT-6M Type B

(2) Description

Metal packaging as described and constructed in accordance with DOT Specification 6M.

(b) Contents

(1) Type and form of material

- (i) Solid radioactive materials which will not decompose at temperatures up to 250°F. Carbide compounds are not authorized; or
- (ii) UO_2 or UO_2 mixtures in the form of powder or compact pellets; or
- (iii) Plutonium nitrate or uranyl nitrate solution in flame sealed glass ampoules or screw top plastic vials, each within one or more additional plastic vials with taped lids, and within a sealed product can or polyethylene bottle containing a sufficient amount of vermiculite to absorb twice the liquid contents present; or

Page 2 - Certificate No. 5908 - Revision No. 10 - Docket No. 71-5908

(b) Contents (continued)

- (iv) Plutonium sources in excess of twenty (20) curies per package must be at least double encapsulated in a metal capsule such that the sources meet the requirements for special form radioactive material.

Inner and outer capsules are individually leak tested during fabrication per ANSI N542-1977, procedure A2.2.3 (He pressure bubble test), or equivalent.

(2) Maximum quantity of material per package and fissile class

- (i) For the material described in 5.(b)(1)(i), the maximum fissile material and maximum hydrogen per package for Fissile Class I is as follows:

<u>Fissile Material</u>	<u>Maximum fissile material per package, kilograms</u>	<u>Hydrogen Material per package, grams</u>
U-235	1.6	20
Pu	0.9*	11
U-233	0.5	6.4

*Because of the 10 watt thermal decay heat limitation, the limit for Pu-238 is 0.02 kilograms. Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements.

- (ii) For the material described in 5.(b)(1)(i) the maximum U-235 loading for uranium bearing materials with an H/X \leq 3 and the minimum transport index to be assigned to each package for Fissile Class II is as follows:

<u>Maximum Kgs U-235</u>	<u>Minimum Transport Index</u>
4.2	0.1
5.4	0.2
7.3	0.5
9.1	1.0

- (iii) For the material described in 5.(b)(1)(ii) the maximum quantity of U-233 is 500 grams at an H/U ratio not to exceed 20 contained within a package size of at least 55 gallons. Each shipment shall be limited as follows:

The minimum transport index for Fissile Class II is 2.5

The maximum number of packages for Fissile Class III is 51.

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5. (b) Contents (continued)

- (iv) For the material described in 5.(b)(1)(iii) the maximum quantity of material is not to exceed 20 ci radioactivity and 40 ml of solution. Fissile material shall not exceed 10 grams.
- (v) For the material described in 5.(b)(1)(iv) the maximum quantity of plutonium is 100 ci.

- 6. Two steel through bolts may be installed between the lid and bottom of the steel drums.
- 7. Venting may be provided by a 1-inch diameter hole in the drum lid backed by a minimum 1/2-inch thick Cerafelt refractory pad.
- 8. Maximum decay heat per package shall not exceed ten (10) watts.
- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: February 28, 1986.

REFERENCES

- Nuclear Materials and Equipment Corporation application dated May 3, 1974.
- Westinghouse Electric Corporation supplement (WAPD-RS(CC)-620) dated May 8, 1973.
- DOE, NR supplements dated: March 28, 1979; and July 19, 1982.
- Allied Chemical Corporation, Report No. ICP-1061, December 1974.
- Monsarco Research Corporation application dated January 10, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5910	4	USA/5910/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company
P.O. Box 785
Lynchburg, VA 24505

Babcock & Wilcox Company application dated
March 6, 1970, as supplemented

c. DOCKET NUMBER 71-5910

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.: NNFD-SA-2
- (2) Description

Fuel container is a 14 gage steel box with a maximum outside cross sectional area of 8.5 square inches, with gasketed lid closure. Fuel container is supported in an open birdcage of slotted angle iron, with outside dimensions 2' x 2' x 12' maximum. Container and birdcage are constructed in accordance with design shown in Appendix A, Figures 1 and 2, of Westinghouse Electric Corporation's application dated November 6, 1967.

(b) Contents

- (1) Type and form of material
- (2) Maximum quantity of material per package

Uranium enriched in the U-235 isotope to any enrichment, as sintered uranium oxide fuel elements, clad with bonded Zircaloy 2. Element dimensions are approximately 0.090" x 3.5" x 96".

Total contents not to exceed 240 pounds, with U-235 not to exceed four (4) kilograms.

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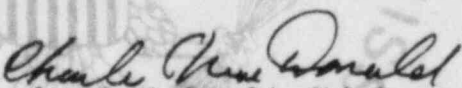
5. (c) Fissile Class III
- Maximum number of packages per shipment Nine (9)
6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: October 31, 1989.

REFERENCES

Babcock & Wilcox Company application dated March 6, 1970.

Westinghouse Electric Corporation's application dated November 6, 1967.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 24 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 5914	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/5914/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for 57.5 x 108 Core
Cartridge Shipping Container dated May 6, 1968,
as supplemented.

c. DOCKET NUMBER 71-5914

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.: 57.5 x 108 Core Cartridge
- (2) Description

The Model No. 57.5 x 108 Core Cartridge Shipping Container was designed for the shipment and storage of new and unirradiated fissile material. This unit consists of two basic assemblies, a barrel assembly and a shipping cradle. The barrel assembly houses and supports the cargo and is supported on a shock-support shipping cradle that is floor mounted to a transport vehicle. The overall height of the assembled unit is 155-3/16 inches and the maximum planform envelope dimensions are 108 by 182 inches. The barrel assembly consists of two concentric cylinders, an inner barrel and an outer barrel, and a top plate. The inner barrel measures approximately 100 inches in height and is manufactured from 1/2 inch thick stainless steel plate rolled into a 57-inch diameter cylinder and welded to a stainless steel flange on the top end, and a stainless steel plate on the bottom end which is drilled and tapped for thirty-two 3/4-inch diameter bolts for fastening the outer barrel. The outer barrel is of carbon steel construction, slides over the inner barrel and is attached to the inner barrel at the bottom flange. The outer barrel is 61-inches in diameter, approximately 149-3/4 inches high and is made from 1-inch thick carbon steel plate. A top flange is welded to the barrel for securing a bolted top plate that encloses the open end of the barrel, and a middle flange is welded to the



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5. (a) (Cont'd)

(2) Description (Cont'd)

barrel to provide a means of attaching the barrel to the shipping cradle. Within the barrel assembly a hoisting rig for handling the core cartridge is secured to the top plate with four, 1-1/2-inch diameter jackscrews and four, 2-inch diameter ACME thread bolts. The core cartridge is suspended from the top flange of the inner barrel. The shipping cradle stands approximately 96-inches high and consists of a base plate, fourteen, 8-inch, schedule 40 steel pipes, a top ring, 10 shear mounts and a support ring. The barrel assembly is suspended and attached to the support ring which in turn rests against and is attached to the ten shear mounts that mount on the top ring of the shipping cradle. The fourteen steel pipes are welded at their ends to the 1-1/4-inch thick steel base plate and the 2-1/4-inch thick top ring. Six stops and eight, 1-1/2-inch diameter bolts secure the shipping cradle to the floor of the transport vehicle. The gross weight of the packaging is 28,800 pounds and when loaded with either an S5W Type 2 or R2, or an S5W-3 or R3 core cartridge, the package weight is 48,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 923J706, Rev. C, 901J914, Rev. D and 901J916, Rev. D.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type:

- (i) S5W-2 or R2 unirradiated naval reactor fuel core cartridge containing a full complement of control rods secured in place by a holdown cap.
- (ii) S5W-3 or R3 unirradiated naval reactor fuel core cartridge containing a full complement of control rods secured in place by a holdown cap.

(2) Maximum quantity of material per package

One fuel assembly as described in 5(b)(1)(i) or 5(b)(1)(ii).

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(c) Fissile Class

III

Maximum number of packages per shipment:

One (1)

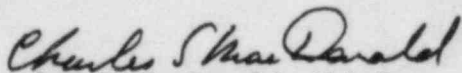
6. Expiration date: January 31, 1988.

REFERENCES

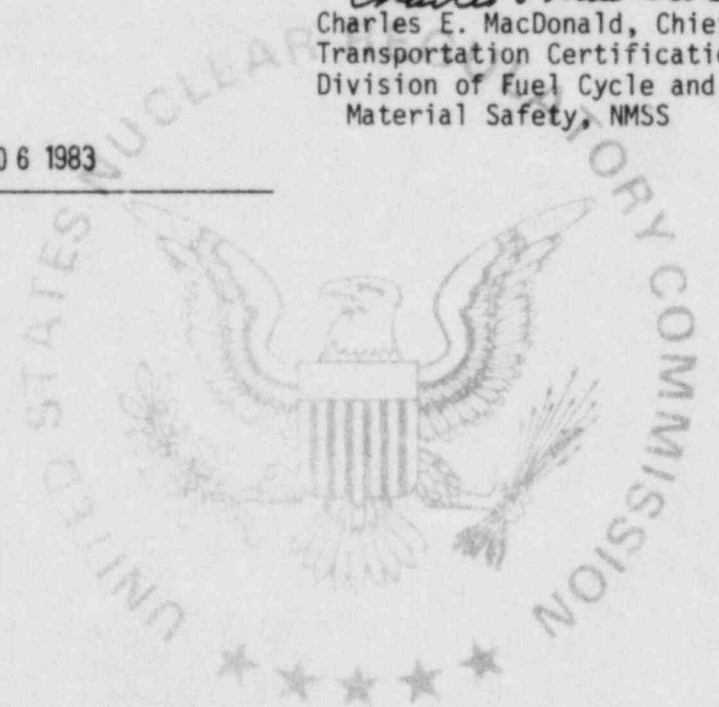
Safety Analysis Report for 57.5 x 108 Core Cartridge Shipping Container, WAPD-OP(R)S-2599, dated May 6, 1968.

Supplemented by Bettis Atomic Power Laboratory letter WAPD-OP(R)S-2801, dated September 3, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 5916	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/5916/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Monsanto Research Corporation
P.O. Box 8, Station B
Dayton, OH 45407

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Monsanto Research Corporation application
dated March 1, 1982.

c. DOCKET NUMBER 71-5916

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.: 2501
- (2) Description

The packaging consists of an interchangeable shielded center section, common top and bottom end sections, and up to two extension sections. Shielding is provided in the center section by successive layers of iron, lead, and Benelex-70. Balsa impact limiters are included in the top and bottom section. Each steel section is bolted to the adjacent section and bolted to a steel I-beam skid-cradle assembly. The cross section geometry is basically octagonal, 48" across the flats. The length ranges from approximately 12 to 16 feet with a maximum gross weight of 17,450 lbs.

(3) Drawings

The packaging is constructed in accordance with the following Monsanto Research Corporation Drawing Nos.:

- E 2501 - AA00, Rev. 2
- E 2501 - AA01, Rev. 2
- E 2501 - AA02, Rev. 3
- E 2501 - AA03, Rev. 2
- D 2501 - AG00, Rev. 2
- D 2501 - AH00, Rev. 2
- D 2501 - AI00, Rev. 3

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(b) Contents

(1) Type and form of material

Po-Be, Am-Be, Pu-238-Be, and Cf-252 neutron sources. Sources must meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

1,509 curies of PoBe, or Am-Be, or Pu-238-Be* or 8.25 curies of CF-252.

(Heat load generated by the contents must not exceed 60 watts of decay heat.)

*Plutonium in excess of twenty (20) curies per package must be in the form of metal or metal alloy; or contained within double encapsulated stainless steel source capsules. Both capsules must be leak tested independently, and must show no leakage for a test having a minimum sensitivity of 1×10^{-5} atm-cm³/sec (air at 25°C and 1 atm leaking to 1×10^{-2} atm).

(c) Fissile Class

For packages containing Pu-238.

I

6. The contents must be secured in the shielded position of the packaging by the source assembly, and locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The nameplates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintain their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: April 30, 1937.

Page 3 - Certificate No. 5916 - Revision No. 4 - Docket No. 71-5916

REFERENCE

Monsanto Research Corporation application dated March 1, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

a. CERTIFICATE NUMBER 5926	b. REVISION NUMBER 10	c. PACKAGE IDENTIFICATION NUMBER USA/5926/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

General Electric Company application dated
January 25, 1980, as supplemented

c. DOCKET NUMBER
71-5926

4. CONDITIONS

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

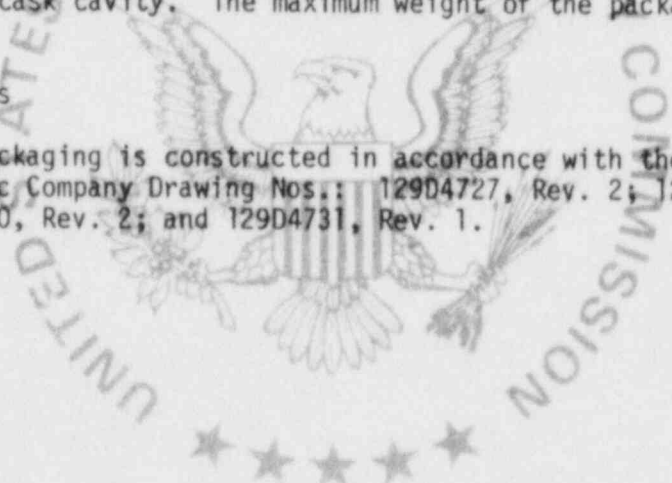
5. (a) Packaging

- (1) Model No.: GE-100
- (2) Description

A steel encased lead shielded shipping cask. The cask is a double-walled steel circular cylinder, 20-1/4-inch diameter by 27-1/8-inch high with a central cavity 7-5/8-inch diameter by 10 inches high. Approximately 5-7/8 inches of lead surround the central cavity. The cask is equipped with a cavity drain line and lifting device. Closure is accomplished by a gasketed and bolted steel lead filled plug. For additional shielding lead, tungsten or uranium liners may be inserted in the cask cavity. The maximum weight of the packaging is 4,800 pounds.

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.: 129D4727, Rev. 2; 129D4729, Rev. 3; 129D4730, Rev. 2; and 129D4731, Rev. 1.



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5. (b) Contents

(1) Type and form of material

- (i) Byproduct and irradiated special nuclear material in the form of fuel rods, or plates, fuel assemblies, or meeting the requirements of special form radioactive material; or
- (ii) Solid nonfissile irradiated metal hardware and reactor control rods (blades).

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 400 watts and 500 grams U-235 equivalent mass fissile material. (U-235 equivalent mass equals U-235 mass plus 1.66 times U-233 mass plus 1.66 times Pu mass.)

Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy, or reactor elements.

(c) Fissile Class

II

Minimum transport index to be shown on label

Contents 5.(b)(1)(i):

5.6

- 6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
- 7. At the time of delivery of the loaded package to a carrier for transport, the package contents shall be dry and the fissile material unmoderated (H to X atomic ratio less than 2).
- 8. Prior to each shipment the silicone rubber lid gasket shall be inspected. The silicone rubber gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.
- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: December 31, 1987.

Page 3 - Certificate No. 5926 - Revision No. 10 - Docket No. 71-5926

REFERENCES

General Electric Company application dated January 25, 1980.

Supplements dated: August 26, 1980; and September 7, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
5939	10	USA/5939/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated
February 21, 1980, as supplemented.

c. DOCKET NUMBER 71-5939

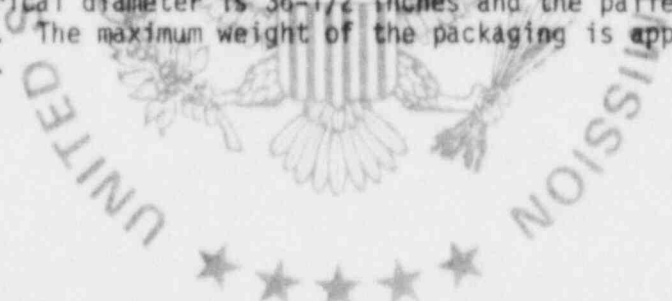
4. CONDITIONS

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.: GE-1500
- (2) Description

A steel encased lead shielded shipping cask. The cask is a double-walled steel circular cylinder, 31-inch-diameter by 48 inches high with a central cavity 7-inch diameter by 25 inches high. The diameter is reduced from 31 inches to 17-1/2 inches by cone construction at the top 7-1/2 inches of the cask. Approximately 11 inches of lead surround the central cavity. The cask is equipped with a cavity drain line and lifting device. Closure is accomplished by a gasketed and bolted steel lead-filled plug. A protective jacket consisting of an upright circular cylinder with open bottom and a protruding box section diametrically across the top and vertically down the sides attaches to a square pallet. Dimensions of the protective jacket are 60-7/8 inches high by 49-3/4 inches wide across the box section. The outer cylindrical diameter is 36-1/2 inches and the pallet is 59-1/2 inches square. The maximum weight of the packaging is approximately 15,000 pounds.



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5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.: 129D4748, Rev. 3; 129D4749, Rev. 3; and 129D4750, Rev. 3.

Lifting and/or tie-down devices which are a structural part of the package must be in accordance with the above drawings.

(b) Contents

(1) Type and form of material

(i) Byproduct material and special nuclear material meeting the requirements of special form radioactive material and antimony pins encased in stainless steel; or

(ii) Byproduct material in the form of $^{90}\text{SrF}_2$ or $^{137}\text{CsCl}$.

(2) Maximum quantity of material per package

Not to exceed a decay heat generation of 3,120 watts and

(i) Item 5(b)(1)(i) above:

Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements, and 500 grams U-235 equivalent mass. (U-235 equivalent mass equals U-235 mass plus 1.66 times Pu mass.)

(ii) Item 5(b)(1)(ii) above:

458,000 ci.

(c) Fissile Class

III

Maximum number of packages per shipment

22

6. For the contents described in Item 5(b)(1)(ii) above:

$^{90}\text{SrF}_2$ must be encapsulated in accordance with Vitro Drawing Nos. H-2-66759, Rev. 0; and H-2-66758, Rev. 0; or

$^{137}\text{CsCl}$ must be encapsulated in accordance with Vitro Drawing Nos. H-2-66760, Rev. 0; and H-2-66761, Rev. 0.

The $^{90}\text{SrF}_2$ and $^{137}\text{CsCl}$ capsules after fabrication must be leak tested using a method having sufficient sensitivity to detect a leak rate (air at standard

CONDITIONS (continued)

Page 3 - Certificate No. 5939 - Revision No. 10 - Docket No. 71-5939

temperature and pressure leaking to 10^{-2} atm) of 10^{-8} atm cc/sec. Any capsule with a detectable leak may not be delivered to a carrier for transport.

7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: December 31, 1987.

REFERENCES

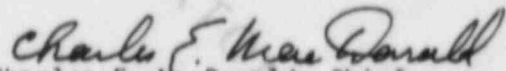
General Electric Company application dated February 21, 1980.

Supplement dated: September 8, 1982.

Oak Ridge National Laboratory letter dated April 3, 1980.

Supplement dated: May 7, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 5942	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/5942/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Application dated March 18, 1980,
as supplemented.

c. DOCKET NUMBER

71-5942

4. CONDITIONS

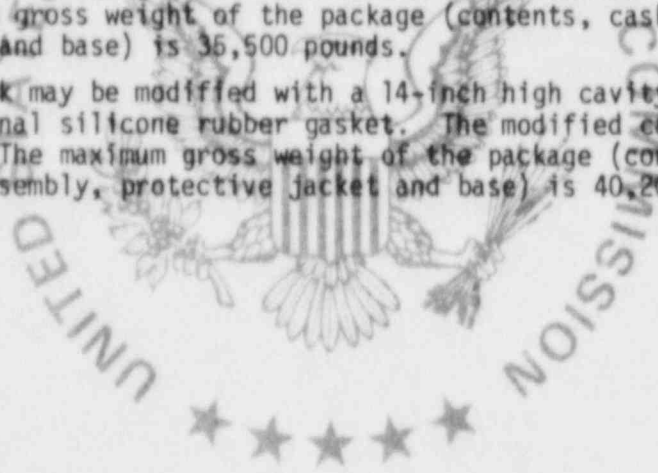
This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5. (a) Packaging

- (1) Model No.: GE-700
- (2) Description

A steel encased lead shielded shipping cask enclosed by a double-walled protective jacket of the same shape with a rectangular baseplate. The cask is a double-walled steel circular cylinder, 37-inch-diameter by 65-inch high with a central cavity 15-inch-diameter by 40-inch high. Approximately 10.25 inches of lead surround the central cavity. The cask is equipped with a cavity drain line, pressure relief valve set at 100 psig, and lifting device. Closure is accomplished by a silicone rubber gasketed and bolted steel lead filled plug. The maximum gross weight of the package (contents, cask assembly, protective jacket and base) is 35,500 pounds.

The cask may be modified with a 14-inch high cavity extension with an additional silicone rubber gasket. The modified cask is 79 inches high. The maximum gross weight of the package (contents, modified cask assembly, protective jacket and base) is 40,200 pounds.



Page 2 Certificate No. 5942 - Revision No. 6 - Docket No. 71-5942

5. (a) (3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.: 129D4768, Rev. 3; 129D4769, Rev. 4; and 129D4770, Rev. 4.

Lifting and/or tie-down devices which are a structural part of the package must be in accordance with the above drawings.

(b) Contents

(1) Type and form of material

Byproduct, source, and special nuclear material contained in solid or metal oxide form.

(2) Maximum quantity of material per package

Not to exceed 700 pounds (including shoring), and

- (i) 740 gm U-235, provided that the maximum U-235 enrichment does not exceed 6 weight percent; or
- (ii) 1,200 gm U-235, provided that the fuel material is in the form of MTR-type fuel elements with a minimum active fuel length of 23 inches; or
- (iii) 220 gm fissile material; or
- (iv) 1,650 gm U-235, provided that the maximum U-235 enrichment does not exceed 3.5 weight percent and the fuel material is in the form of 88 rods loaded with 0.376-inch-diameter pellets with a minimum active fuel length of 37 inches; or
- (v) those values presented in Figure 1, UO₂ Weight Limits for Model 700 Shipping Container, of Exhibit A to this application, applicable to fuel material in the form of rods with a minimum pellet diameter of 0.40 inch; or
- (vi) 5,100 gm U-235, provided the fuel is in the form of ETR-type fuel elements (GETR Fuel) with each element containing no more than 510 gm U-235 and inserted in the spaced stainless steel fuel shipping basket described in GE Drawing No. 106D4150, Rev. 0.; or

CONDITIONS (continued)

Page 3 - Certificate No. 5942 - Revision No. 6 - Docket No. 71-5942

5. (b) (2)(vii) 6,200 gm U-235, provided the fuel is in the form of MURR TRTR type elements containing not more than 775 gm U-235 per element; loaded and spaced in the stainless steel fuel shipping basket as described in MURR Drawing No. 1228, Sheets 1 thru 5, Revision 0. Fuel elements shall have at least 150 days cooling time since last reactor operation.

(3) Maximum quantity of radioactive decay heat per package

(i) 6,500 watts for dry shipments, or

(ii) 1,500 watts for wet shipments, provided that the cavity shall contain at least a 1,000 cu in air void (at standard temperature and pressure) at the time of delivery to a carrier for transport.

(c) Fissile Class	III
Maximum number of packages per shipment	2

6. The radioactive material must be in the form of fuel rods, or plates, fuel assemblies, or meeting the requirements of special form radioactive material.
7. Shoring must be provided to minimize movement of contents during accident conditions of transport.
8. Prior to each shipment the silicone rubber lid gasket(s) must be inspected. This gasket(s) must be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line must be sealed with appropriate sealant applied to threads of pipe plug.
9. The applicant must confirm annually that the pressure relief valve is operable at 100 psig.
10. When needed, sufficient antifreeze in the cask shall be used to prevent damage of any component of the package due to freezing.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: June 30, 1985.

Page 4 - Certificate No. 5942 - Revision No. 6 - Docket No. 71-5942

REFERENCES

General Electric application dated March 18, 1980.

Supplement dated: August 10, 1982.

University of Missouri letter dated March 20, 1980.

Appendix 6-A regarding University of Missouri's quality assurance program is not considered part of this application.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER 5950	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/5950/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Battelle Columbus Laboratories
505 King Avenue
Columbus, OH 43201

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Battelle Columbus Laboratories application
dated August 7, 1981.

c. DOCKET NUMBER

71-5950

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.: BCL-4

(2) Description

Steel encased lead shielded shipping package. The package is provided with recessed plug-type lid and gasketed, bolted closure, lifting and tie-down devices and relief valve, vent line, and drain line penetrations. Containment for the contents is provided by an inner can assembly or by material in special form. The packaging has dimensions, weight, and shielding as follows:

Exterior height, in	64.8
Exterior diameter, in	26.4
Cavity height, in	42.5
Cavity diameter, in	6.1
Lead shielding, in	8.4
Loaded weight, lb	13,200 (Incl 270-lb skid)

(3) Drawing

The packaging is constructed in accordance with Battelle Memorial Institute Drawing No. BCL4-01, Sheet 1 and 2, Rev. D.

Page 2 - Certificate No. 5950 - Revision No. 4 - Docket No. 71-5950

5. (b) Contents

Type and form and maximum quantity of material per package.

Byproduct material, source material and special nuclear material not to exceed 400 watts decay heat in solid metal or oxide form packaged within an inner can assembly or material meets the requirements of special form radioactive material and limitations on fissile loading for the Fissile Class as follows:

Inner can assembly:

Battelle Memorial Institute Drawing No. BCL4-49, Rev. C.

Fissile Class I	650*
Fissile Class III	2000*

* (grams U-235 equivalent mass)

(c) Fissile Class	I and III
Maximum number of packages per shipment for Class III	One (1)

6. The U-235 equivalent mass must be determined by the following method:

U-235 equivalent mass equals U-235 mass plus 1.75 times U-233 mass plus 1.60 times Pu mass.

7. At the time of delivery of the loaded package to a carrier for transport, the package contents must be (1) dry (contents of inner can assembly must not decompose up to a temperature of 750°F) and the fissile material unmoderated (H to X atomic ratio less than 2) and (2) so limited that the dose rate will not exceed 10 millirem per hour at three (3) feet from the external surface of the package.
8. The maximum gross weight of the cavity contents must not exceed 180 pounds (inner can assembly, radioactive material, etc.).

CONDITIONS (continued)

Page 3 - Certificate No. 5950 - Revision No. 4 - Docket No. 71-5950

9. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet all of the acceptance and periodic tests specified in Section 8.0 of this Application.

The following item in the thermal acceptance tests (8.1.6) is changed as follows:

- (4) The acceptance criteria must be that the maximum measured temperature of any portion of the cask must not exceed the temperatures indicated in Figure 3.3 of this application by more than 25°F. In this comparison, solar heating and ambient temperature differences between Figure 3.3 and the test data must be taken into account.

10. The following item in the Test Procedure (8.1.3), Section 8.0 of the Application, is changed as follows:

- g. Remove pressurization line and insert plug in pressure port according to the loading procedure. Use teflon tape or other compatible sealant in threads.

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

12. Expiration date: September 30, 1986.

REFERENCE

Battelle Columbus Laboratories application dated August 7, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5957	11	USA/5957/B()F	1	6

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Battelle Columbus Laboratories
505 King Avenue
Columbus, OH 43201

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Battelle Columbus Laboratories application
dated June 11, 1980, as supplemented.

71-5957

c. DOCKET NUMBER

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.: BMI-1
- (2) Description

A steel-encased lead shielded shipping cask. The basic cask body is a cylinder 33.37 inches in diameter by 73.37 inches high formed by two concentric stainless steel shells whose annular region is filled with lead. The outer 1/2-inch thick shell has a 0.12-inch thick plate spot welded to it, providing a 0.06-inch thick air gap insulator. The inner shell is 15.5 inches inside diameter by 54 inches inside length. The cask lid is a stainless steel weldment having 7.75 inches of lead shielding. The cask lid is secured to the cask by twelve steel studs which are welded to the cask body. The cask is provided with a drain line with needle valve and plug, pressure gauge, and a pressure relief valve. The total cask weight, including maximum contents of 1,800 lbs, is 23,660 lbs.

(3) Drawings

The cask is constructed in accordance with the following Battelle Memorial Institute (BMI) Drawing Nos.: 43-6704-0001, Rev. B; and 41-4409-0003, Rev. B.

Page 2 - Certificate No. 5957 - Revision No. 11 - Docket No. 71-5957

5. (a) Packaging (continued)

(4) Product Containers

The various authorized product containers are constructed in accordance with the following Drawing Nos.:

- (i) Inner can assembly as shown in BMI Drawing No. 00-000-421, Rev. C.
- (ii) Basket Assembly as shown in BMI Drawing Nos. BCL-000-500, Rev. A; BCL-000-501, Rev. A; and 0048, Rev. A.
- (iii) Fermi Fuel Element copper casting assembly as shown in BMI Drawing No. K5928-5 0049D, Rev. to May 12, 1966.
- (iv) Basket Assembly as shown in BMI Drawing No. 1020, Rev. B or GA Drawing No. 9590001, Rev. A. Failed fuel assemblies must be seal welded in aluminum or stainless steel tubes with wall and end cap thicknesses of at least 0.015 inch.
- (v) Basket Assembly defined by BMI Drawing No. BCL-000-500, Rev. A, as modified by BMI Drawing Nos. 00-00-236, Rev. C, and BCL-000-502, Rev. B.
- (vi) Basket Assembly and storage can defined by BMI Drawing No. 00-000-391, Rev. C, and Atomic International Drawing No. AIHL, S8DR 0019-01, Rev. A, respectively.
- (vii) Inner can assembly as shown in Union Carbide Corporation Drawing No. 101501, Rev. -.

(b) Contents

(1) Type and form of material

- (i) Intact irradiated MTR- or BRR-type fuel assemblies containing not more than 200 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.
- (ii) Intact irradiated Enrico Fermi Core. A fuel assembly containing not more than 4.77 kgs U-235 prior to irradiation. Uranium may be enriched to 25.6 w/o in the U-235 isotope.

Page 3 - Certificate No. 5957 - Revision No. 11 - Docket No. 71-5957

5. (b) Contents (continued)

- (iii) Greater than Type A quantity of radioactive material which may include uranium enriched in the U-235 isotope, U-233, plutonium, as metal, oxides, or compounds which are thermally stable up to 600°F. Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy, or reactor elements.
- (iv) Greater than Type A quantity of byproduct material meeting the requirements of special form radioactive material.
- (v) Greater than Type A quantity of byproduct material in normal form as metal, oxides, or compounds which are thermally stable up to 600°F.
- (vi) Irradiated Triga Type fuel assemblies described in Section 6.6 of the application (pp. 6-23 through 6-24(c)).
- (vii) Irradiated S8DR fuel elements 0.56-inch OD by 18.7 inches long by 0.010-inch wall thickness of Hastelloy-N. The fuel material is UZrH fully enriched in U-235.
- (viii) Intact irradiated CP-5 fuel assemblies containing not more than 176 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93 w/o in the U-235 isotope. Active fuel length shall be 28.5 inches.
- (ix) Solid nonfissile irradiated hardware which may contain encapsulated fission monitors.
- (x) Irradiated uranium oxide waste enriched in the U-235 isotope up to a nominal 93 w/o which are thermally stable up to 800°F.
- (xi) Irradiated uranium enriched in the U-235 isotope meeting the requirements of special form radioactive material.

(2) Maximum quantity of material per package

The minimum cooling time of each fuel assembly and rod is 90 days, maximum decay heat generation per package not to exceed 1.5 kw, and the external dose rate not to exceed 10 mrem/hr 3 feet from the external surface of the cask and:

(i) For the contents described in 5(b)(1)(i):

Twenty-four (24) fuel assemblies as contained in product containers specified in 5(a)(4)(ii) or 12 fuel assemblies as contained in product containers specified in 5(a)(4)(v).

Page 4 - Certificate No. 5957 - Revision No. 11 - Docket No. 71-5957

5. (b) Contents (continued)

- (ii) For the contents described in 5(b)(1)(ii):

One (1) fuel assembly as contained in product container specified in 5(a)(4)(iii).

- (iii) For the contents described in 5(b)(1)(iii):

480 grams U-233 or 480 grams Pu-239 or 800 grams U-235 as contained in product container specified in 5(a)(4)(i).

- (iv) For the contents described in 5(b)(1)(iv):

Gamma sources securely confined in the cask cavity to preclude secondary impacts during accident conditions of transport. Thermal heat generation rate is limited to 200 watts.

- (v) For the contents described in 5(b)(1)(v):

Contained in product containers specified in 5(a)(4)(i) and limited to 200 thermal watts.

- (vi) For the contents described in 5(b)(1)(vi):

Thirty-eight (38) fuel assemblies as contained in product containers specified in 5(a)(4)(iv). Fuel assemblies with an initial enrichment (U-235 in U) of greater than 70 w/o U-235 are limited to 19 assemblies per product container. Shipments of less than 19 assemblies with a U-235 enrichment greater than 70 w/o may be combined with assemblies of 70 w/o U-235 or less provided: $x/38 + y/19 \leq 1$; $x = \text{no. assy's} \leq 70 \text{ w/o U-235}$, $y = \text{no. assy's} > 70 \text{ w/o U-235}$.

- (vii) For the contents described in 5(b)(1)(vii):

Twenty-four (24) fuel elements per can and six sealed cans per basket as described in 5(a)(4)(vi). Each of the six cans may contain up to 818 g U-235 and 158 g hydrogen. The cask is limited to 4,908 kg U-235.

- (viii) For the contents described in 5(b)(1)(viii):

Twelve (12) fuel assemblies.

5. (b) Contents (continued)

(ix) For the contents described in 5(b)(1)(ix):

Thermal heat generation rate is limited to 200 watts.

(x) For the contents described in 5(b)(1)(x):

Twenty-four (24) containers each limited to 352 grams U-235 as contained in product containers specified in 5(a)(4)(vii). The decay heat per container is limited to 20 watts. The containers must be leak tested in accordance with Union Carbide Corporation letter dated November 17, 1980.

(xi) For the contents described in 5(b)(1)(xi):

Twenty-four (24) capsules each limited to 100 grams U-235.

(c) Fissile Class

I and III

(1) Class I

For the contents specified in 5(b)(1)(iii) and limited in 5(b)(2)(iif).

(2) Maximum number of packages per shipment as Fissile Class III

For the contents specified in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(ix), and 5(b)(1)(xi); and limited in 5(b)(2)(i), 5(b)(2)(ii), 5(b)(2)(vi), 5(b)(2)(vii), 5(b)(2)(viii), 5(b)(2)(ix), and 5(b)(2)(xi):

One (1) package.

6. For Item 5(b)(1)(iii), mixtures of fissile material are authorized, provided the following equation is satisfied:

$$\frac{X}{480} + \frac{Y}{480} + \frac{Z}{800} = 1, \text{ where}$$

X = Grams U-233 to be shipped
 Y = Grams Pu-239 to be shipped
 Z = Grams U-235 to be shipped

7. Except for contents described in 5(b)(1)(ii) and 5(b)(1)(iv); and limited in 5(b)(2)(ii) and 5(b)(2)(iv), the cask must be shipped dry.

Page 6 - Certificate No. 5957 - Revision No. 11 - Docket No. 71-5957

8. If the cask contents of 5(b)(1)(ii) or 5(b)(1)(iv) are shipped wet, the licensee must confirm that the pressure relief valve is operable (set pressure - 75 psig). When needed, sufficient antifreeze in the cask must be used to prevent damage of any component of the package by freezing.
9. Loading and unloading operations of the contents described in 5(b)(1)(iii) and limited in 5(b)(2)(iii) must preclude contact of water with the contents.
10. The presence and effectiveness of the Boral poison plate in the Basket Assemblies as shown in BMI Drawing Nos. BCL-000-500, Rev. A; 0048, Rev. A; and 00-000-236, Rev. C, must be verified by neutron measurements prior to first use and records maintained of such verification. Verification of the presence of the Boral must be made in each subsequent use.
11. Contents 5(b)(1)(i) and 5(b)(1)(x) may be mixed provided the sum of the product containers and fuel assemblies does not exceed 24.
12. Contents must be securely confined in the cask cavity to preclude secondary impacts during accident conditions of transport.
13. Prior to each use, adequacy of containment vessel must be demonstrated by performance of the leak test described in Section 7.1.1.1 of the application.
14. Gaskets and seals (cask and fuel canister) must be replaced at least every 12 months or earlier if visible degradation occurs.
15. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
16. Expiration date: July 31, 1985.

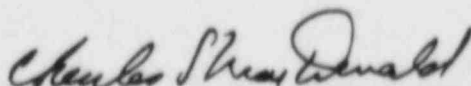
REFERENCES

Battelle Columbus Laboratories application dated June 11, 1980.

Supplements dated: August 25, 1980; November 23, 1982; and June 13 and December 28, 1983.

General Atomic Company supplements dated: August 3 and September 1, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JAN 31 1984

**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
5971	4	USA/5971/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

General Electric Company application dated
February 20, 1980, as supplemented.

c. DOCKET NUMBER 71-5971

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.: GE-200
- (2) Description:

A steel encased lead shielded shipping cask. The cask is a double-walled steel circular cylinder, 20-1/4-inch diameter by 53 inches high with a central cavity 7-5/8-inch diameter by 37 inches high. Approximately 5-7/8 inches of lead surround the central cavity. The cask is equipped with a cavity drain line and lifting device. Closure is accomplished by a silicone rubber gasketed and bolted steel lead filled plug. For additional shielding, lead-filled stainless steel liners may be inserted in the cask cavity. A protective jacket consisting of an upright circular cylinder with open bottom and a protruding box section diametrically across the top and vertically down the sides attaches to a square pallet. Dimensions of the protective jacket are 65-3/8 inches high by 37-5/8 inches wide across the box section. The outer cylindrical diameter is 26-3/4 inches and the pallet is 47-1/2 inches square. The maximum weight of the packaging is approximately 10,000 pounds.



Page 2 - Certificate No. 5971 - Revision No. 4 - Docket No. 71-5971

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

- 129D4756, Rev. 0 129D4758, Rev. 0
- 129D4757, Rev. 0 129D4759, Rev. 0*

*All components are to be considered safety related.

(b) Contents

(1) Type and form of material

- (i) Byproduct and special nuclear material in the form of fuel rods, or plates, fuel assemblies, or meeting the requirements of special form radioactive material; or
- (ii) Solid nonfissile irradiated metal hardware, reactor control rods (blades), and reactor start-up sources.

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 780 watts and 500 grams U-235 equivalent mass. (U-235 equivalent mass equals U-235 mass plus 1.66 times U-233 mass plus 1.66 times Pu mass.)

Plutonium in excess of twenty (20) curies per package shall be in the form of metal, metal alloy, or reactor elements.

(c) Fissile Class

II

Minimum transport index to be shown on label

Contents 5.(b)(1)(i):

2.3

- 6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
- 7. At the time of delivery of the loaded package to a carrier for transport, the package contents shall be dry and the fissile material unmoderated (H to X atomic ratio less than 2).
- 8. Prior to each shipment, the silicone rubber lid gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.

Page 3 - Certificate No. 5971 - Revision No. 4 - Docket No. 71-5971

9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: June 30, 1985.

REFERENCES

General Electric Company application dated February 20, '1980.

Supplements dated: August 26, 1980; and July 18, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, M55

Date: JUL 29 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a CERTIFICATE NUMBER 5979	b REVISION NUMBER 5	c PACKAGE IDENTIFICATION NUMBER USA/5979/B()	d PAGE NUMBER 1	e TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Alpha-Omega Services, Inc. 16220 Gundry Avenue Paramount, CA 90723	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Alpha-Omega Services, Inc. application dated June 1980, as supplemented. 71-5979	c. DOCKET NUMBER
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4. CONDITIONS

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

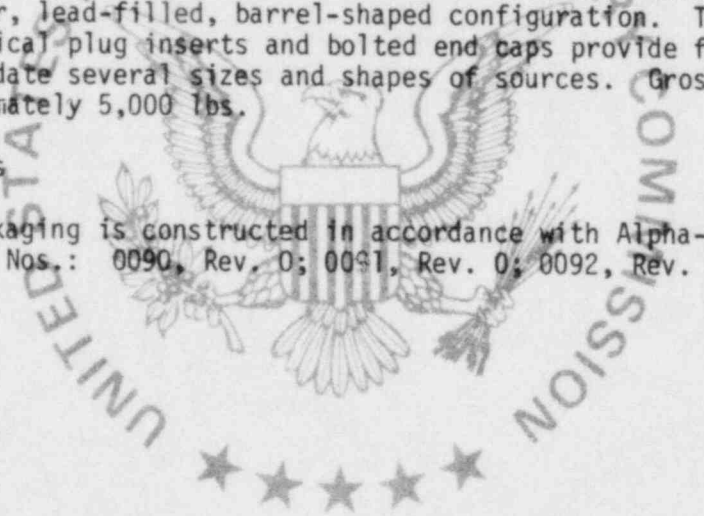
5. (a) Packaging

- (1) Model No.: 5979
- (2) Description

A shipping container for teletherapy cobalt sources. Configuration of the outer container is box-like measuring approximately 38" x 50" x 40". The box is lined with 4.5" of plywood with a 0.125" outer steel shell welded to an exterior angle framework. Transverse strips across the bottom facilitate use of a fork-lift and lifting lugs are provided at the four top corners. The inner shield vessel is essentially a 24" diameter, lead-filled, barrel-shaped configuration. Three different cylindrical plug inserts and bolted end caps provide flexibility to accommodate several sizes and shapes of sources. Gross weight is approximately 5,000 lbs.

(3) Drawings

The packaging is constructed in accordance with Alpha-Omega Services, Inc. Drawing Nos.: 0090, Rev. 0; 0091, Rev. 0; 0092, Rev. 0; and 0093, Rev. 0.



Page 2 - Certificate No. 5979 - Revision No. 5 - Docket No. 71-5979

5. (b) Contents

(1) Type and form of material

Cobalt 60 or cesium 137 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

15,000 curies Co-60 or 3,000 curies Cs-137, with decay heat load not to exceed 200 watts.

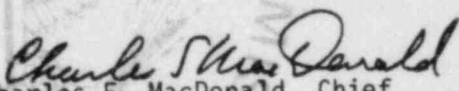
6. Lifting eyes shall be covered or blocked to prevent use as tie-down attachments.
7. The shield vessel closures shall be equipped with gaskets.
8. Bolts used to secure the shield vessel closure caps shall be secured against loosening by vibration during transport.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: July 31, 1985.

REFERENCES

Alpha-Omega Services, Inc. application dated June 1980.

Supplement dated: April 12, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
5980	8	USA/5980/B()F	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions"
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated
October 10, 1979, as supplemented.

c. DOCKET NUMBER

71-5980

4. CONDITIONS

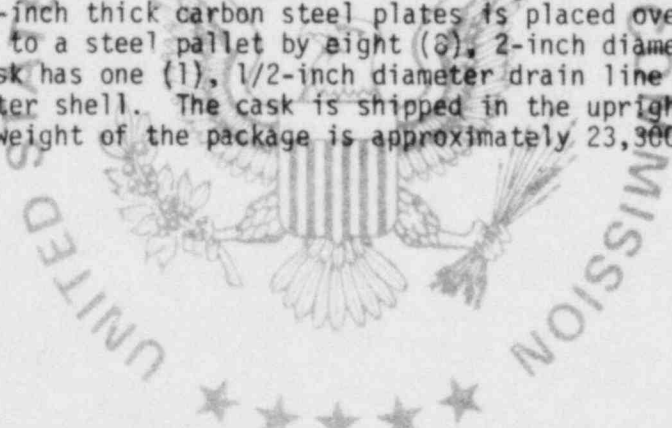
This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

- (1) Model No.: GE-600
- (2) Description

A steel-encased lead shielded shipping cask. The basic cask body is a cylinder 34 inches in diameter by 59.12 inches high formed by two concentric steel shells whose annular region is filled with 6 inches of lead. The cavity is 20-1/2 inches ID by 46 inches high, 3/8-inch thick stainless steel cylinder. A recessed plug-type cask lid, consisting of a steel weldment filled with lead, is secured to the cask body by six (6), 1-inch diameter steel bolts. A silicone rubber gasket provides the seal. A protective jacket consisting of a double-walled structure of 1/2-inch thick carbon steel plates is placed over the cask and bolted to a steel pallet by eight (8), 2-inch diameter steel bolts. The cask has one (1), 1/2-inch diameter drain line from the cavity to the outer shell. The cask is shipped in the upright position. The total weight of the package is approximately 23,300 pounds when loaded.



Page 2 - Certificate No. 5980 - Revision No. 8 - Docket No. 71-5980

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.: 129D4742, Rev. 1; 129D4743, Rev. 1; and 129D4744, Rev. 1.

Lifting and/or tie-down devices which are a structural part of the package must be in accordance with the above drawings.

(b) Contents

(1) Type and form of material

(i) Byproduct material and irradiated special nuclear material in solid or solid oxide form, but specifically not loose powders. Contents are to be clad, encapsulated or contained in a metal encasement of such material as to withstand the combined effects of the internal heat load and the 1475°F fire with the closure pre-tested for leak tightness. Also, byproduct material and irradiated special nuclear material meeting the requirements of special form radioactive material.

(ii) Neutron sources meeting the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements, and

(i) For the contents described in 5.(b)(1)(i) the maximum decay heat not to exceed 600 watts and the fissile content not to exceed 500 grams of U-235, 300 grams U-233, 300 grams Pu, or a prorated quantity of each such that the sum of the ratios does not exceed unity. When the contents of this paragraph are in the form of irradiated reactor fuel, the fuel must have been cooled for a minimum of 90 days, and no more than 10,000 ci of noble gases must be available for release from the fuel rod plenums. The cask must be leak tight to 1×10^{-3} atm-cm³/sec under normal conditions of transport; or

(ii) For the contents described in 5.(b)(1)(i) the maximum decay heat not to exceed 600 watts and the fissile content not to exceed 1200 grams fissile provided: (1) the fissile material is contained in standard waste liners constructed of 5-inch Schedule 40 pipe with a maximum inside length of 39-5/16 inches, (2) no more than four such liners are shipped at one time, (3) each liner contains no more than 300 grams fissile, and (4) the cask is provided with a positioning lattice to maintain separation between the liners.

Page 3 - Certificate No. 5980 - Revision No. 8 - Docket No. 71-5980

- (iii) For the contents described in 5.(b)(1)(ii) the maximum decay heat not to exceed 50 watts and not more than 500 grams U-235 equivalent mass. The external dose rate not to exceed 1,000 mrem/hr at 3 feet from the surface of a package without internal shielding.

- 5. (c) Fissile Class II and III
 - (1) Minimum transport index to be shown on label for Class II For the contents specified in 5.(b)(1)(i) and limited in 5.(b)(2)(i).
8.4
 - (2) Maximum number of packages per shipment for Class III For the contents specified in 5.(b)(1)(i) and 5.(b)(1)(ii) and limited in 5.(b)(2)(ii) and 5.(b)(2)(iii).
Two (2)
- 6. The U-235 equivalent mass must be determined by the following method:
U-235 equivalent mass equals U-235 mass plus 1.66 times U-233 mass plus 1.66 times Pu mass.
- 7. Package contents must be dry and the fissile material unmoderated (H to X atomic ratio less than 2).
- 8. Neutron sources in meeting the requirements of special form radioactive material shall be packaged in a 5 w/o boron-polyethylene liner (G.E. Drawing No. 129D4745, Rev. 1) and placed in the cask cavity.
- 9. For packaging of neutron sources, the cavity drain line must be closed with a plug with a melting temperature of 200°F and the cask cavity must be dry before delivery of the package to a carrier.
- 10. For packaging of other than neutron sources, the cask must be delivered to a carrier dry and the cavity drain line must be closed with a plug which will maintain its seal at temperatures up to at least 620°F.
- 11. Prior to each shipment, the silicone rubber lid gasket(s) must be inspected. This gasket(s) must be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line must be sealed with appropriate sealant applied to threads of pipe plug.
- 12. For packaging of neutron sources, 50 times the measured neutron dose rate at 3 feet from the surface of a cask must be less than 1,000 mrem/hr.

Page 4 - Certificate No. 5980 - Revision No. 8 - Docket No. 71-5980

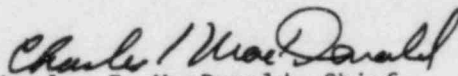
13. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
14. Expiration date: December 31, 1984.

REFERENCES

General Electric Company's application dated October 10, 1979.

Supplements dated: May 21, and October 8, 1980; November 14, 1980; and April 5, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 5984	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/5984/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

J. L. Shepherd and Associates
740 Salem Street
Glendale, CA 91203

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

J. L. Shepherd and Associates application
dated September 12, 1974, as supplemented.

c. DOCKET NUMBER

71-5984

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.: 5984

(2) Description

A protective overpack which provides impact resistance, and thermal resistance for its contents which are contained within a single snug-fitting shielded inner Type A packaging. The overpack consists of a vented-steel jacketed, laminated plywood outer container. Dimensions of the overpack are approximately 28" in diameter by 43" high and the plywood thickness is approximately 4" on the sides and 6" on the top and bottom. The total weight including weight of the contents is approximately 1,780 pounds.

(3) Drawings

The overpack is constructed in accordance with J. L. Shepherd & Associates Drawing Nos. A-0068-2C-1 and A-0068-2C.

The inner shielded container is constructed in accordance with J. L. Shepherd & Associates Drawing No. A-0068-1B or DOT Specification 7A packaging. The special form source capsule is constructed in accordance with J. L. Shepherd & Associates Drawing No. A-0068-10 or to meet the requirements of special form radioactive material.

Page 2 - Certificate No. 5984 - Revision No. 3 - Docket No. 71-5984

5. (b) Contents

(1) Type and form of material

Cesium 137 as cesium chloride sources doubly encapsulated in stainless steel tubes to meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

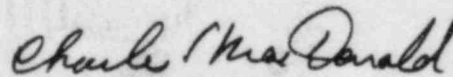
12,000 curies.

6. Contents must be positioned within a single snug-fitting shielded Type A packaging within the protective overpack. The Type A packaging must have a metal outer wall and meet the requirements of DOT Specification 7A packaging.
7. New construction of overpacks are not authorized under this Certificate of Compliance.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: February 28, 1985.

REFERENCES

- J. L. Shepherd and Associates' application dated September 12, 1974.
Supplement dated: January 20, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 08 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 5998	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/5998/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions"

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. PREPARED BY (Name and Address): General Electric Company P.O. Box 460 Pleasanton, CA 94556	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: General Electric Company application dated February 21, 1980, as supplemented. 71-5998 c. DOCKET NUMBER
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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.: GE-400
 - (2) Description
Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pellet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The physical description is as follows:

Cask height, in	24.1
Cask diameter, in	20.0
Cavity height, in	3.0
Cavity diameter, in	2.4
Lead shielding, in	8.3
Protective jacket height, in	29.7
Protective jacket width, in	32.0
Packaging weight, lb	3,800
 - (3) Drawings
The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

856B880, Rev. 7	106D3983, Rev. 2
106D3980, Rev. 2	178B9960, Rev. 0
277E411, Rev. 2	

Page 2 - Certificate No. 5998 - Revision No. 4 - Docket No. 71-5998

5. (b) Contents

(1) Type and form of material

- (i) Byproduct material meeting the requirements of special form radioactive material; or
- (ii) Solid nonfissile irradiated metal hardware and reactor control rods (blades).

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 400 watts.

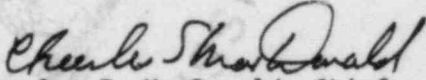
- 6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
- 7. Package contents shall be delivered to a carrier dry.
- 8. Prior to each shipment, the silicone rubber lid gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.
- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: July 31, 1985.

REFERENCES

General Electric Company application dated February 21, 1980.

Supplement dated: August 26, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER 6002	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/6002/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions"
 - 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. PREPARED BY (Name and Address):
U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Safety Analysis Report for S3W/S4W New
Subassembly shipping container dated
October 28, 1968.

c. DOCKET NUMBER 71-6002

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

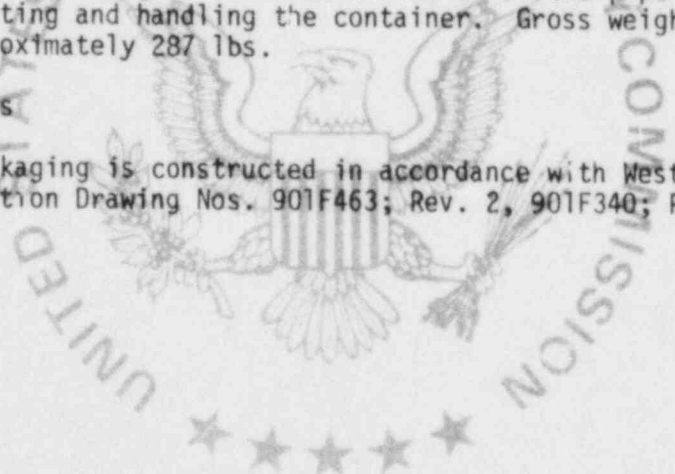
(1) Model No.: S3W/S4W New Subassembly

(2) Description

The S3W/S4W New Subassembly shipping container is fabricated from a 43-1/2 inch length of ASTM A-312-304 6-inch Schedule 40 seamless pipe. A 6-inch 150 lb socket type flange is welded to each end of this pipe. Both ends of the container are closed with an end plate and eight 3/4-10 CRES bolt and nut combinations securing each end plate. One of the end plates incorporates a 0-15 psi pressure gage and a 7-10 lb relief valve. Eight lugs are welded to the OD of the pipe body and are used for lifting and handling the container. Gross weight of the packaging is approximately 287 lbs.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 901F463; Rev. 2, 901F340; Rev. C, and 901F459; Rev. 3.



CONDITIONS (continued)

Page 2 - Certificate No. 6002 - Revision No. 2 - Docket No. 71-6002

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type,

- (i) S3W/S4W Core 1 new subassembly.
- (ii) S3W/S4W Core 2 new subassembly.
- (iii) S3W/S4W Core R2 new subassembly.

(2) Maximum quantity of material per package

One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii) or 5(b)(1)(iii).

(c) Fissile Class

III

Maximum number of packages per shipment:

6

6. Expiration date: March 31, 1988.

REFERENCE

Safety Analysis Report for S3W/S4W New Subassembly, WAPD-OP(R)S-2894 dated October 28, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a CERTIFICATE NUMBER 6003	b REVISION NUMBER 6	c PACKAGE IDENTIFICATION NUMBER USA/6003/B()F	d PAGE NUMBER 1	e TOTAL NUMBER PAGES 5
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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 PREPARED BY (Name and Address): U.S. Department of Energy Division of Naval Reactors Washington, DC 20585	b TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Safety Analysis Report for M-130 shipping container dated December 30, 1968, as supplemented.
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c DOCKET NUMBER 71-6003

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.: M-130

(2) Description

The M-130 shipping container is an upright cylinder 84 inches in diameter by 158 inches overall height. The container walls consist of a finned 1-inch thick outer shell (fabricated from either carbon steel, carbon steel with stainless steel clad, or solid stainless steel), 10 inches of lead shielding, and a 1-inch thick inner pressure vessel (fabricated from carbon steel clad with stainless steel). The top of the container is covered with a shielded closure head which is bolted to the container and seals the pressure vessel. An access opening with a bolted shield plug is provided in the closure head for loading and unloading spent fuel.

The pressure vessel has an inside diameter of 55 inches. The central region contains a secondary heat exchanger (not used during shipment) surrounded by a 1/2-inch thick carbon steel backup cylinder 29 inches in diameter. The annulus which remains between the backup cylinder and the pressure vessel provides a space 13 inches wide and 130 inches high for spent fuel. The spent fuel is contained in the annulus by module holders designed for the particular core to be shipped.

Page 2 - Certificate No. 6003 - Revision No. 6 - Docket No. 71-6003

5. (a) Packaging (cont'd)

(2) Description (cont'd)

The container has external penetrations to the pressure vessel for steam and water relief lines and a fill and drain line (which are capped during shipment) and a pressure sensing line which remains open to a pressure gage during shipment. The container also has penetrations which do not open to the pressure vessel for secondary heat exchanger lines (which are capped during shipment) and a temperature sensing line.

For LWBR spent fuel shipments, the heat exchanger and associated structures have been removed, external penetrations plugged and seal welded, and an external shield and energy absorber added during modifications.

The container is supported on its transport vehicle by an "A" frame structure. Gross weight of the loaded container without its support structure is approximately 228,000 pounds.

(3) Drawings

The packaging is constructed in accordance with General Electric Drawing Nos. 247E209, Sheet 1, Rev. R; Sheet 2, Rev. K; Sheet 3, Rev. T; Sheet 4, Rev. U; Sheet 5 of 5, Rev. F and 247E228, Rev. F.

For LWBR spent fuel shipments, the container has been modified in accordance with Westinghouse Electric Drawing 1176J48, Sheet 1 Rev. G, Sheet 2 Rev. E and an external energy absorber added in accordance with Westinghouse Electric Drawing 1525E32, Rev. A.

(b) Contents

(1) Type and form of material

Irradiated fuel assemblies, activated corrosion products and structural parts containing up to 40 gallons of residual contaminated water. The fuel assemblies and structural parts are of the following types:

- (i) S3W/S4W fuel subassemblies of core type 2.
- (ii) S5W fuel modules of core types 2 or 3.
- (iii) S5W corner fuel modules of core types 2 or 3.
- (iv) DIG fuel modules of core types 1 or 2.

Page 3 - Certificate No. 6003 - Revision No. 6 - Docket No. 71-6003

5. (b) Contents (cont'd)

(1) Type and form of material (cont'd)

- (v) D1G removable fuel assemblies of core types 1 or 2.
- (vi) SIC/S2C fuel modules with control rods.
- (vii) SIC/S2C peripheral fuel modules.
- (viii) S3G-3/3A fuel module with or without control rods.
- (ix) SAD cell.
- (x) S3G-3/3A irradiated thermocouples and thermocouple cases.
- (xi) LWBR blanket fuel modules.
- (xii) LWBR reflector fuel modules.
- (xiii) LWBR seed fuel modules.

(2) Maximum quantity of material per package

- (i) 52 fuel assemblies as described in 5(b)(1)(i).
- (ii) 12 fuel assemblies as described in 5(b)(1)(ii) or 9 fuel assemblies as described in 5(b)(1)(ii) and 4 fuel assemblies as described in 5(b)(1)(iii).
- (iii) 6 fuel assemblies as described in 5(b)(1)(iv) and 4 fuel assemblies as described in 5(b)(1)(v).
- (iv) 9 fuel assemblies as described in 5(b)(1)(vi) and 8 fuel assemblies as described in 5(b)(1)(vii).
- (v) 10 fuel assemblies as described in 5(b)(1)(viii).
- (vi) 9 fuel assemblies as described in 5(b)(1)(viii) and one fuel assembly as described in 5(b)(1)(ix).
- (vii) 9 fuel assemblies as described in 5(b)(1)(viii) and one structure as described in 5(b)(1)(x).
- (viii) 3 fuel assemblies as described in 5(b)(1)(xi).
- (ix) 4 or less fuel assemblies as described in 5(b)(1)(xii).
- (x) 6 fuel assemblies as described in 5(b)(1)(xiii).

Shipments shall be further limited by shielding and thermal requirements as follows:

5. (b) Contents (cont'd)

- (1) Shipment of contents specified in 5(b)(1)(iv) and 5(b)(1)(v) and limited in 5(b)(2)(iii) shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.
- (2) Shipment of contents specified in 5(b)(1)(vi) and 5(b)(1)(vii) and limited in 5(b)(2)(iv) shall be made in a stainless steel M-130 container and shall have a decay heat load not to exceed 18,960 Btu/hr per shipment.
- (3) Shipment of contents specified in 5(b)(1)(viii), 5(b)(1)(ix) and 5(b)(1)(x) and limited in 5(b)(2)(v), 5(b)(2)(vi) and 5(b)(2)(vii) shall be made at a time after shutdown as determined from Bettis Atomic Power Laboratory report WAPD-OP(PP)S-4401 dated June 29, 1979 and shall have a decay heat load not to exceed 28,620 Btu/hr for the shipboard core and 30,000 Btu/hr for the prototype core.
- (4) Shipment of contents specified in 5(b)(1)(i), 5(b)(1)(ii) and 5(b)(1)(iii) and limited in 5(b)(2)(i) and 5(b)(2)(ii) shall be made no earlier than 72 days after shutdown and shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.
- (5) Shipment of contents specified in 5(b)(1)(xi) and limited in 5(b)(2)(viii) shall have a heat load not to exceed 48,000 Btu/hr and a residual water quantity not to exceed 4.6 gallons.
- (6) Shipment of contents specified in 5(b)(1)(xii) and limited in 5(b)(2)(ix) shall have a heat load not to exceed 3,672 BTU/hr.
- (7) Shipment of contents specified in 5(b)(1)(xiii), and limited in 5(b)(2)(x) shall have a heat load not to exceed 27,600 BTU/hr and a residual water quantity not to exceed 7.5 gallons.

(c) Fissile Class	★ ★ ★ ★ ★	III
Maximum number of packages per shipment:		one

6. For shipments involving the contents specified in 5(b)(1)(ii) or 5(b)(1)(iii) the M-130 package shall be inspected to verify that boron poison plates are in the module holders.
7. For shipments involving the contents specified in 5(b)(1)(viii), 5(b)(1)(ix) or 5(b)(1)(x) the thermocouples and thermocouple cases if included or the vacant module holder shall be located in the mid-position of either cage and module holder assembly.
8. Shipments shall be made in the dry condition, except for residual water as limited in 5(b)(1), 5(b)(2)(5), and 5(b)(2)(7).
9. Expiration date: May 31, 1988.

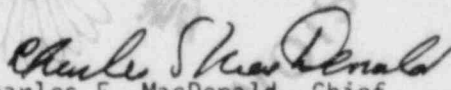
Page 5 - Certificate No. 6003 - Revision No. 6 - Docket No. 71-6003

REFERENCES

Safety analysis report for M-130 shipping container, MAO-E8-703 dated December 30, 1968.

Supplements: Naval Reactor letters A#2256 dated February 24, 1969 and G#1931 dated March 3, 1969; General Electric Company letter ONP-74520-526 dated April 3, 1972; Naval Reactors letter G#3207 dated April 27, 1972; General Electric Company letter ONP-74520-528 dated April 28, 1972; Naval Reactors letter G#3250 dated June 6, 1972; General Electric Company letters ONP-74570-635 dated October 25, 1972; ONP-74570-654 dated December 4, 1972; ONP-74570-666 dated December 12, 1972; ONP-74570-682 dated January 12, 1973; ONP-74570-698 dated January 31, 1973; ONP-74570-687 dated February 6, 1973; ONP-74390-65 dated March 26, 1973; DLGN-85570-854 dated September 24, 1973; DLGN-85570-901 dated January 10, 1974; Naval Reactors letter G#4061 dated January 29, 1974; General Electric Company letters DLGN-85570-924 dated February 15, 1974; DLGN-85570-923 dated March 6, 1974; DLGN-85570-969 dated May 24, 1974; Naval Reactors letter G#4991 dated November 25, 1975; General Electric Company letters ONP-74340-JTT-73 dated December 17, 1975; CGN-85570-1145 dated September 9, 1976; CGN-85570-1146 dated September 10, 1976; CGN-85570-1148 dated September 14, 1976; Bettis Atomic Power Laboratory letter WAPD-R(K)-1378 dated August 30, 1976; WAPD-OP(PP)S-4401 dated June 29, 1979; Naval Reactor letters G#6197 dated July 13, 1979; G#7136 dated March 17, 1982; and WAPD-LD(CES)SE-181 dated September, 1981; WAPD-LP(CES)SE-96 dated February, 1982; WAPD-LP(CES)SE-170 dated July 1981; and Naval Reactors letter G#7582 dated September 7, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 26 1983

**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
6049	2	USA/6049/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions"
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for 426A and 426B
shipping containers dated January 31, 1969,
as supplemented.

71-6049

c. DOCKET NUMBER

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 Nos.: 426A and 426B
- (2) Description

The Model Nos. 426A and 426B containers are used to ship and store new unirradiated S5W Core R3 core cartridge assemblies, new unirradiated S3W Core R2 fuel subassemblies, and new unirradiated S1W Core R3 core cartridge assemblies. The 426A container, the basic design for this series of shipping and storage containers, is a horizontal cylindrical metal weldment 73-1/2" diameter by 226 inches in length. The container, mounted on wooden skids, is 82-9/16 inches high and weighs 6,000 pounds empty. The 426B container is essentially identical to the 426A container in all respects except for length. The 426B container was made 292 inches long (66 inches longer than the 426A) to accommodate the no longer existing S1W-4 instrumented core cartridge and weighs 7,900 pounds empty. The container assembly consists of three major subassemblies: the upper section, the lower section, and the cradle which supports the core within the container assembly and supports the new fuel assembly. The maximum gross weight of the 426A container is 27,960 lbs.

CONDITIONS (continued)

Page 2 - Certificate No. 6049 - Revision No. 2 - Docket No. 71-6049

(3) Drawing

The packaging is constructed in accordance with Applied Design Company Drawing No. 426A401, Rev. C.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type,

- (i) S5W Core R3 cartridge assembly, with all control rods installed and restrained in a fully inserted position with rod holddown caps.
- (ii) S3W Core R2 fuel assemblies, with covers of borated steel secured in place over the assemblies, in the S3W/S4W New Core Component Adapter Kit.
- (iii) S1W Core R3 cartridge assembly, with all control rods installed and restrained in a fully inserted position by a control rod holddown plate.

(2) Maximum quantity of material per package

One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii) or 5(b)(1)(iii).

(c) Fissile Class

III

Maximum number of packages
per shipment:

one

6. Expiration date: January 31, 1988.

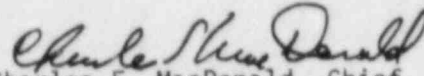
REFERENCE

Safety Analysis Report for 426A and 426B shipping containers, WAPD-OP(R)S-3105, dated January 31, 1969.

Page 3 - Certificate No. 6049 - Revision No. 2 - Docket No. 71-6049

Supplements: Bettis Atomic Power Laboratory letters WAPD-OP-(R)S-3373 dated June 11, 1969, WAPD-OP(R)C-71 dated March 6, 1972, WAPD-OP(R)C-139 dated August 4, 1972, WAPD-OP(R)C-145 dated August 11, 1972 and WAPD-OP(R)C-164 dated October 6, 1972.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____



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
6058	8	USA/6058/B()	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Ecology
P.O. Box 7246
Louisville, KY 40207

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Protective Packaging, Inc., application
dated March 4, 1974, as supplemented.

71-6058

c. DOCKET NUMBER

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.: B-3
- (2) Description

The packaging consists of a lead shielded steel weldment in the shape of a right hollow cylinder with a bottom and a recessed, plugtype gasketed and bolted lid. The packaging provides a minimum of 6 inches of lead shielding. Packaging features include lifting and tie-down devices and a drain to the central cavity. The maximum weight of the loaded packaging is 30,000 pounds.

The outer shell is of a laminated steel constructed and is 41 inches in diameter and 57 inches high. The two laminates are of plate material 1/2-inch and 1/4-inch in thickness. The inner shell is of 1/2-inch thick steel plate. The internal cavity dimensions are 26-1/2 inches in diameter and 43-1/4 inches high. The lid is of the same construction as the sides and bottom and is secured to the body of the packaging by twelve, 1-1/4-inch diameter by 2-inch long high strength bolts and sealed with a silicone O-ring.

Page 2 - Certificate No. 6058 - Revision No. 8 - Docket No. 71-6058

5. (a) Packaging (continued)

(3) Drawing

The packaging is as described and constructed in accordance with Battelle Memorial Institute Drawing No. 9958-8501-0001E, Revision B or Revision C, as amended by Union Carbide Corporation letter dated November 3, 1979.

(b) Contents

(1) Type and form of material

- (i) Byproduct and uranium enriched in the U-235 isotope, U-233 or plutonium as solids, non-powder, and dry, which will not decompose at temperatures up to 575°F and packaged within DOT Specification 17H steel drums.
- (ii) Byproduct and uranium enriched in the U-235 isotope, U-233 or plutonium which meets the requirements of special form radioactive material.
- (iii) Byproduct material and uranium enriched in the U-235 isotope, U-233, or plutonium as solids, non-powder, and dry which will not decompose at temperatures up to 575°F, packaged within a nominal 1/2-inch thick (24-inch OD) polyethylene High Integrity Container (HIC). Liquids must be solidified in Chemtree Iron Oxide mix in a steel container. Small items, including glassware, must be placed in 1-gal steel containers and compressed (as required).

(2) Maximum quantity of material per package

For the contents described in 5(b)(1)(i) and 5(b)(1)(ii):

Not to exceed 400 watts thermal decay.

For the contents described in 5(b)(1)(iii):

The HIC must be limited to 200 A₂ quantities of solidified liquid radioactive material and not more than 50 A₂ quantities of other radioactive materials. The maximum thermal² decay heat load must not exceed 15 watts.

Page 3 - Certificate No. 6058 - Revision No. 8 - Docket No. 71-6058

5. (b) (2) (continued)

For the fissile contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii) not to exceed the following:

<u>Fissile Material</u>	<u>Maximum per Package (grams)</u>	<u>Maximum H/X</u>
U-235	350	500
U-233	200	450
Plutonium*	200	800

or, pro-rated mixtures such that the sum of the ratios of the quantity of each fissile material to its maximum per packaging does not exceed unity.

*Plutonium in excess of 20 curies per package must be in the form of reactor fuel, fuel elements, metal, or metal alloy.

(c) Fissile Class

II

For contents containing special nuclear material:

Minimum transport index
to be shown on label

10.0

6. For gamma-emitting special form materials, at least 5 inches of additional lead shielding must be added as a lining on all sides within the internal cavity.
7. The total weight of the contents including additional lead shielding as may be required shall not exceed 9,000 pounds.
8. Prior to each shipment, the lid O-ring shall be inspected. The O-ring shall be replaced with a new O-ring if inspection shows any defects or every twelve (12) months, whichever occurs first.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: February 28, 1985.

Page 4 - Certificate No. 6058 - Revision No. 8 - Docket No. 71-6058

REFERENCES

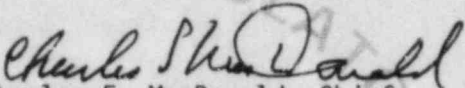
Protective Packaging, Inc. application dated March 4, 1974.

Supplement dated: August 12, 1974.

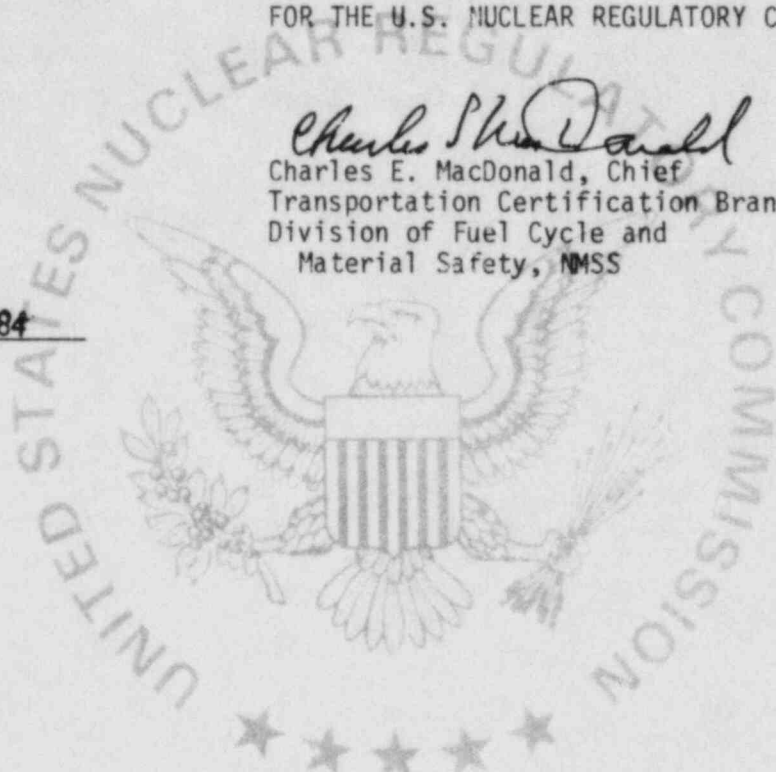
Battelle Columbus Laboratories supplement dated April 12, 1979.

Union Carbide Corporation supplements dated: November 3, 1979; and December 21, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JAN 06 1984



**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
6078	8	USA/6078/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, CT 06095

Combustion Engineering application dated
December 10, 1979, as supplemented.

c. DOCKET NUMBER

71-6078

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

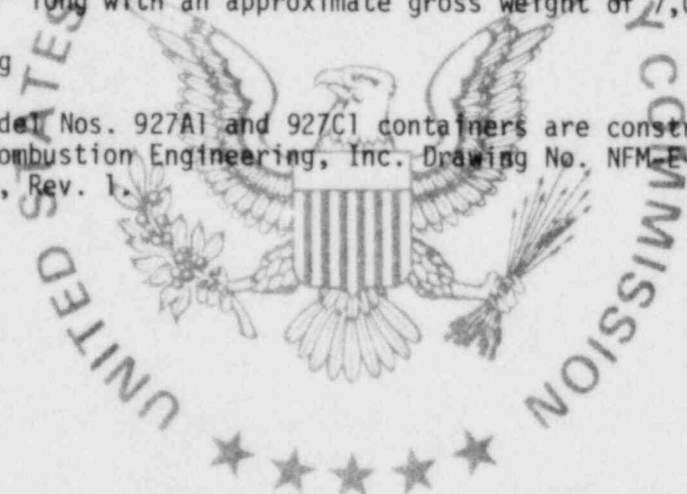
(1) Model Nos.: 927A1 and 927C1

(2) Description

A steel fuel bundle shipping container consisting of a strongback and fuel bundle clamping assembly, shock mounted to a steel outer container. A minimum 1/4" thick, 6" x 6" x 8" high steel separators are bolted between fuel bundles. The Model No. 927A1 container is approximately 43" in diameter by 189" long with an approximate gross weight of 6,200 lbs. The Model No. 927C1 container is approximately 43" in diameter by 216" long with an approximate gross weight of 7,000 lbs.

(3) Drawing

The Model Nos. 927A1 and 927C1 containers are constructed in accordance with Combustion Engineering, Inc. Drawing No. NFM-E-4108, Sheets 1 thru 4, Rev. 1.



Page 2 - Certificate No. 6078 - Revision No. 8 - Docket No. 71-6078

5. (b) Contents

(1) Type and form of material

- (i) Model No. 927A1: fuel bundles consisting of 0.38" diameter uranium dioxide fuel pellets clad in 0.028" thick zircaloy tubes in a 14 x 14 square array with a 0.58" pitch. Each fuel bundle consists of a maximum of 176 fuel rods at 4.1 w/o enrichment in the U-235 isotope.
- (ii) Model No. 927C1: fuel bundles consisting of 0.325" diameter uranium dioxide pellets clad in 0.025" thick zircaloy tubes in a 16 x 16 square array with a 0.506" pitch. Each fuel bundle consists of a maximum of 236 fuel rods at 4.1 w/o enrichment in the U-235 isotope.

(2) Maximum quantity of material per package

Two (2) 14 x 14 fuel bundles containing not more than 35.0 Kgs U-235;
or

Two (2) 16 x 16 fuel bundles containing not more than 35.0 kgs U-235.

(c) Fissile Class

III

Maximum number of packages per shipment

Eight (8)

- 6. Each fuel assembly shall be unsheathed or shall be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath shall not be folded or taped in any manner that would prevent flow of liquids into or out of the sheathed fuel assembly.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: June 30, 1985.

REFERENCES

Combustion Engineering, Inc. application dated December 10, 1979.

Supplement dated: May 30, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date:

SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a CERTIFICATE NUMBER 6115	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/6115/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

E.I. du Pont de Nemours & Company
Savannah River Plant
Aiken, SC 29801

E.I. du Pont de Nemours & Company Report
No. DPSPU 75-124-1, June 1975.

c. DOCKET NUMBER

71-6115

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.: R1010-0032
- (2) Description

Packaging for an instrumented, unirradiated test fuel bundle. The contents are held within an inner container by six cushioned aluminum clamp assemblies bolted to six, 1/2-inch thick steel supports welded to the bottom and sides of the inner container. The 338-1/4-inch by 10-inch by 7-1/2-inch inner container is constructed from 1/4-inch thick 304 stainless steel plate. The inner container is held within a 455-inch by 24-1/2-inch by 18-1/4-inch carbon steel outer container, and is supported by urethane foam cushioning material. Positive closure is accomplished for the inner and outer containers by bolted cover plates. The package gross weight is 8,350 pounds.

(3) Drawings

The packaging is fabricated in accordance with Argonne National Laboratories (ANL) Drawing Nos. R1010-0032-DC, Rev. 4; EB-39887-E, Rev. 0; and R1010-9927-DE, Rev. 0.

Page 2 - Certificate No. 6115 - Revision No. 2 - Docket No. 71-6115

5. (b) Contents

(1) Type and form of material

Unirradiated, instrumented, fast test reactor (FTR) type fuel, containing sintered UO_2 pellets with maximum 93.2 w/o enrichment in the U-235 isotope. The fuel element bundle consists of 19 FTR type fuel elements arranged in a triangular array in a hexagonal can, 0.056-inch separation maintained by wire wrap, and 0.028-inch separation between the outer fuel elements and shroud can maintained by wire wrap. The fuel element is 0.230-inch diameter, has a 36-inch active length, and 0.015-inch wall 316 stainless steel clad with welded end plugs.

(2) Maximum quantity of material per package

Not to exceed 3.0 kg U-235.

(c) Fissile Class

III

Maximum number of packages per shipment

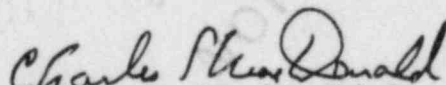
One (1)

6. Prior to shipment each of the 18 eye bolts in the outer container cover plates shall be replaced with 1/2-inch diameter bolts.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: September 30, 1987.

REFERENCE

E.I. du Pont de Nemours & Company Report No. DPSPU 75-124-1, June 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 6134	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/6134/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

Safety Analysis Report for 11.9 New Fuel
Shipping Container dated April 22, 1969
as supplemented.

c. DOCKET NUMBER

71-6134

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.: 11.9 New Fuel
- (2) Description

The 11.9 New Fuel container consists of a two section horizontal cylindrical shell approximately 31 inches diameter by 239 inches long. The shell is reinforced by internal bulkheads and is parted along an axial plane into an upper and lower section. The bulkheads are designed to frame a central chamber within which the module to be carried is supported and held in place by cradle frames and clamps. The cradle frames are supported from shockmounts which are attached to brackets inside the container shell. The container incorporates features for lifting, hoisting and for purging and pressurizing to 5 psig of nitrogen. The fuel module is shipped with design control rod and lead screw installed and either with or without the motor tube installed. When shipped with a motor tube, the leadscrew and control rod assembly is held in place by the design leadscrew restraint latches. When shipped without a motor tube, the leadscrew and control rod assembly is held in place by a special plug and holddown cap which bear against the top of the leadscrew and are anchored to the closure block by two, 1-3/8" diameter bolts or two, 1-5/16" diameter bolts for Core 4 or Core 4A respectively. Shipments may be made by motor vehicle, rail, cargo aircraft, or water transportation. The maximum weight of the loaded container is approximately 5,100 lbs.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 961D919, Rev. 4, Sheet 1 thru 5 of 5 and 903E166, Rev. 6, Sheet 1 of 1.

Page 2 - Certificate No. 6134 - Revision No. 3 - Docket No. 71-6134

5. (b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the S5W Core 4 or S5W Core 4A type with control rod installed. A control rod holddown cap and plug must be installed when shipping without motor tubes.

(2) Maximum quantity of material per package

One fuel assembly as described in 5(b)(1).

(c) Fissile Class

III

Maximum number of packages per shipment

4

6. Expiration date: January 31, 1988.

REFERENCE

Safety Analysis Report for 11.9 New Fuel shipping container, WAPD-OP(R)P-159 dated April 22, 1969.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1 a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6142	2	USA/6142/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

Safety Analysis Report for Bettis Disposable
Waste shipping container dated September 30, 1969.

c. DOCKET NUMBER 71-6142

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.: Bettis Disposable Waste
- (2) Description

The packaging consists of a disposable concrete vault enclosed in a reusable steel overpack. The concrete vault is a poured concrete block measuring 51" square by 49" high. The inner cavity is centered in the vault and may be one of two sizes: 15" square by 16" deep or 27" square by 28" deep. The smaller cavity is surrounded by 18" of structural concrete on the bottom and sides and by 15" on the top; the larger cavity is surrounded by 12" on the bottom and sides and by 9" on the top. The overpack is a weldment of 2-1/2" by 5" rectangular steel tubes to 1/2" steel plate and is sized and constructed to snugly enclose the concrete vault. The lid is similarly constructed and is secured to the overpack by a bolted and gasketed closure. The overall dimensions of the package are 64" by 64". The gross weight is approximately 16,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 945F976, Rev. 4; 930C940, Rev. 4 and 976C870, Rev. 3.

Page 2 - Certificate No. 6142 - Revision No. 2 - Docket No. 71-6142

(b) Contents

(1) Type and form of material

Byproduct and special nuclear material in the form of radioactive waste which has been packaged in smaller cans or pails or as unpackaged solid waste sealed in poured concrete.

(2) Maximum quantity of material per package

110 equivalent grams of U-235, where the number of equivalent grams of U-235 is determined by the equation: $1.0 \times \text{gram U-235} + 1.4 \times \text{grams U-233} + 1.6 \times \text{grams plutonium}$.

(c) Fissile Class

III

Maximum number of packages per shipment

2

6. Expiration date: May 31, 1988.

REFERENCE

Safety Analysis Report for Bettis Disposable Waste shipping container, WAPD-0(A0)-5029 dated September 30, 1969.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

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
6144	8	USA/6144/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
U.S. Ecology P.O. Box 7246 Louisville, KY 40207	Nuclear Engineering Company Application dated December 21, 1979.

c. DOCKET NUMBER 71-6144

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.: B-2

(2) Description

The packaging consists of a rectangular, double-walled box of welded mild steel construction with dimensions of 142 inches by 91 inches by 54 inches high which encloses secondary containers. The maximum weight of the loaded package is 42,000 pounds.

The double-walled box consists of an outer 1-inch thick steel shell and an inner 2-inch thick steel shell separated by 56 shock tubes, eight on each end, and ten on each of the two sides, top and bottom. The shock tubes are constructed of both 6-inch Schedule 40 and 8-inch Schedule 30 pipe. The tubes are 5 inches in length and are welded to the exterior of the inner box.

The cover of the outer box is secured by forty-six, 1-1/4 inch diameter high strength bolts. The lid of the inner box is sealed by two lengths of Garlock single lip closure seals and the seal pressure is maintained by steel springs which force the seal lip against the walls of the inner box.

(3) Drawing

The packaging is constructed in accordance with Kenasco Corporation Drawing No. 6901-002B and Bill of Material No. 6901-002C.

Page 2 - Certificate No. 6144 - Revision No. 8 - Docket No. 71-6144

5. (b) Contents

(1) Type and form of material

Radioactive material as solids, in normal or special forms packaged within DOT specification 17H, 55-gallon steel drums, or other secondary containers which meets the requirements of DOT Specification Type A packaging.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material, not to exceed 5 watts and 5,000 pounds including weight of the contents, secondary container(s), and shoring.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Dunnage shall be provided in the shipping cask cavity sufficient to prevent movement of the secondary containers relative to the outer packaging under normal or accident conditions.

8. Prior to each shipment, the inner and outer lid gaskets shall be inspected. The gaskets shall be replaced with new Garlock Model 23 Split Kloxure if inspection shows any defects or every twelve (12) months, whichever occurs first.

Page 3 - Certificate No. 6144 - Revision No. 8 - Docket No. 71-6144

- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: January 31, 1985.

REFERENCE

Nuclear Engineering Company application dated December 21, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odgaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 05 1984



Page 2 - Certificate No. 6166 - Revision No. 2 - Docket No. 71-6166

(b) Contents

(1) Type and form of material

Mixtures of solid or powdered material in capsules which meet the requirements of special form radioactive material. Mixtures may contain any combination of the following isotopes: Cm-243, Cm-245, Cm-247, Cf-249, Cf-251, Am-242m, U-233, U-235, Pu-238, Pu-239 and Pu-241.

(2) Maximum quantity of material per package

Not to exceed 100 watts, and mass of approved isotopes not to exceed 15 grams.

6. The package authorized by this certificate is hereby approved under general license provisions of 10 CFR §71.12.

7. Expiration date: October 31, 1984.

REFERENCES

Lawrence Livermore Laboratory Report No. UCRL-52083, June 11, 1976

Lawrence Livermore Laboratory letter to C. D. Jackson, U.S. DOE, San Francisco Operations Office, May 18, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 06 1983

**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
6172	4	USA/6172/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Babcock & Wilcox Company
P. O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company application dated
December 2, 1969.

c. DOCKET NUMBER 71-6172

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.: 961A

(2) Description

Steel shipping container constructed in accordance with Applied Design Company, Inc. Drawing Nos. 961A1, 961A2, 961A3. Steel angles shown as Items 6 and 10 on Drawing Nos. 961A3 and 961A2, respectively, shall be at least 2 inches high.

(b) Contents

(1) Type and form of material

Clad reactor preassemblies as described in application dated December 2, 1969. Uranium may be enriched to any degree in the U-235 isotope.

(2) Maximum quantity of material per package

Not more than 2.9 kilograms of U-235.


Page 2 - Certificate No. 6172 - Revision No. 4 - Docket No. 71-6172

5. (c) Fissile Class III
Maximum under of packages per shipment Three (3)
6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: October 31, 1989.

REFERENCE

Babcock & Wilcox Company application dated December 2, 1969.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 25 1984

**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
6188	3	USA/6188/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for 25.0 Spare
Module Shipping Container dated February 6, 1969,
as supplemented.

c. DOCKET NUMBER 71-6188

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.: 25.0 Spare Module
- (2) Description

The container, constructed of 1/8-inch carbon steel plate, is circular in cross section, 40 inches diameter, and approximately 360 inches long. It has a removable upper half shell employing a stainless steel closure flange with a rubber O-ring gasket for sealing. The four main handling points of the container are located on the sides at the container base. Steel skids run the full length of the container. Each fuel module to be transported is clamped into a removable trough-shaped strongback which is shock mounted to the interior of the lower shell. The flanged carbon steel strongback with its stainless steel liner is 323 inches long having holes at regular intervals with stamped station numbers identifying those holes to be used in clamping a particular fuel module. Each fuel module type has its own clamping arrangement; some clamps will not be in use and are stored within the container. When a fuel module is installed in the sealed container, the container is purged and pressurized with dry nitrogen gas. Maximum weight of loaded container is approximately 10,580 lbs.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 901E851, Rev. 1, Sheet 1 thru 9 of 9 and 901E440, Rev. 2, Sheet 1 thru 9 of 9.

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6206	6	USA/6206/AF	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Babcock & Wilcox Company
P.O. Box 1260
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company application dated
February 27, 1980, as supplemented.

c. DOCKET NUMBER 71-6206

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.: Model B
- (2) Description

A fuel assembly shipping container consisting of a steel strongback, clamping assembly, shock mounted to a steel outer container. Two, 3/16-inch thick, 8-5/8-inch high and full length stainless steel plates containing 1.5% minimum boron are positioned between adjacent fuel assemblies. The outer container is approximately 40 inches in diameter by 200 inches long.

(3) Drawings

The container is constructed in accordance with Babcock & Wilcox Company Drawing Nos. PE-52F, Revision 1; PE-53F, Revision 1; and PE-54F, Revision 0.

(b) Contents

(1) Type and form of material

UO₂ sintered pellet diameters ranging from 0.30 inch to 0.60 inch. Uranium may be enriched to a maximum 4.05 w/o in the U-235 isotope. The pellets are clad in minimum 0.020-inch thick zircalloy or minimum 0.016-inch thick stainless steel rods. The rods are assembled into fuel assemblies with a maximum cross section of 8.6 inches by 8.6 inches. The void volume within the fuel assembly must not exceed two times the volume of UO₂ in the fuel assembly.

(2) Maximum quantity of material per package

Two fuel assemblies containing not more than 18.8 kg U-235 per assembly.

Page 2 - Certificate No. 6206 - Revision No. 6 - Docket No. 71-6206

- | | | |
|----|---|------------|
| 5. | (c) Fissile Class | II and III |
| | (1) Minimum transport index
to be shown on label for
Class II | 6.3 |
| | (2) Maximum number of packages
per shipment for Class III | 20 |
6. Each fuel assembly must be unsheathed or must be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath must not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.
7. There must be a clamp bow to restrain each spacer grid and end fitting. The ratio of assembly weight to the number of clamp bows must not exceed 168.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: March 31, 1985.

REFERENCES

Babcock & Wilcox Company application dated February 27, 1980 (complete).

Supplements dated: September 10 and October 12, 1981; and January 24, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: FEB 06 1984

**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
6227	1	USA/6227/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Union Carbide Corporation P.O. Box Y Oak Ridge, TN 37830	Oak Ridge Y-12 Plant Report Nos. Y-DD-152 June 1974 (DT-2), YDD-153, July 1974 (DT-5), Y-DD-160, December 1974 (DT-7).

c. DOCKET NUMBER 71-6227

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 Nos.: DT-2, DT-5, and DT-7
 - (2) Description
- Packagings for Type A quantity of uranium metals, alloys, and compounds. Contents are centered within outer steel drums by industrial fiberboard having a minimum density of 14 lbs/ft³.
- The DT-2 is an 18-gauge DOT Specification 17H steel drum 22-1/2 inches in diameter by 33 inches high; it has a 14-gauge lid closed by a 12-gauge bolted ring with drop-forged lugs and a 5/8-inch steel bolt and lock nut. A 16-inch x 16-inch x 0.5-inch cavity in the fiberboard holds the content plates. The package gross weight is 220 pounds.
- The DT-5 is an 18-gauge DOT Specification 17H steel drum; 22-1/2 inches in diameter by 33 inches high; it has a 14 gauge lid closed by a 12-gauge bolted ring with drop-forged lugs and a 5/8-inch steel bolt and lock nut. The inner container is a DOT Specification 17H drum; 14 inches in diameter 24-5/8 inches high. The package gross weight is 330 pounds.

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5. (a) (2) Description (continued)

The DT-7 is a 20-gauge DOT Specification 37A steel drum; 16 inches in diameter by 24-1/2 inches high; it has a 14-gauge lid closed by an 18-gauge bolted ring with drop-forged lugs and a 3/8-inch steel bolt and lock nut. The inner container is a 12-quart tinned can 8-5/8 inches in diameter by 13 inches high with a press-on lid. The package gross weight is 75 pounds.

(3) Drawings

The containers are constructed in accordance with drawing found in the Oak Ridge Y-12 Plant reports:

- (i) For the Model No. DT-2, pg 7 of Report No. Y-DD-152;
- (ii) For the Model No. DT-5, pg 7 of Report No. Y-DD-153 (as revised by letter to report Y-DD-153 recipients from R. J. Fraser);
- (iii) For the Model No. DT-7, pg 7 of Report No. Y-DD-160.

(b) Contents

(1) Type and form of materials

Uranium of any enrichment in the U-235 isotope.

- (i) A flat plate of uranium metal with dimensions no greater than 16 inches x 16 inches x 0.4 inch, held in the Model No. DT-2.
 - (ii) Uranium metal or alloy as a single piece with no dimension greater than 14-inches held in an inner DOT Specification 17H container (14 inches in diameter by 24-5/8 inches high) in the Model No. DT-5.
 - (iii) Uranium metals, alloys or dry compounds held in the Model No. DT-7 within a 12-quart tinned can, 8-5/8 inches in diameter by 13 inches high with a press-on lid.
- (2) Maximum quantity of material per package not to exceed a Type A quantity of radioactive material.
- (i) For the material described in 5(b)(1)(i) not more than 32 kg of uranium.
 - (ii) For the material described in 5(b)(1)(ii) not more than 20.0 kg of U-235.
 - (iii) For the material described in 5(b)(1)(iii) not more than 250 g of U-235.
 - (v) For the material described in 5(b)(1)(iii) not more than 500 g of U-235.

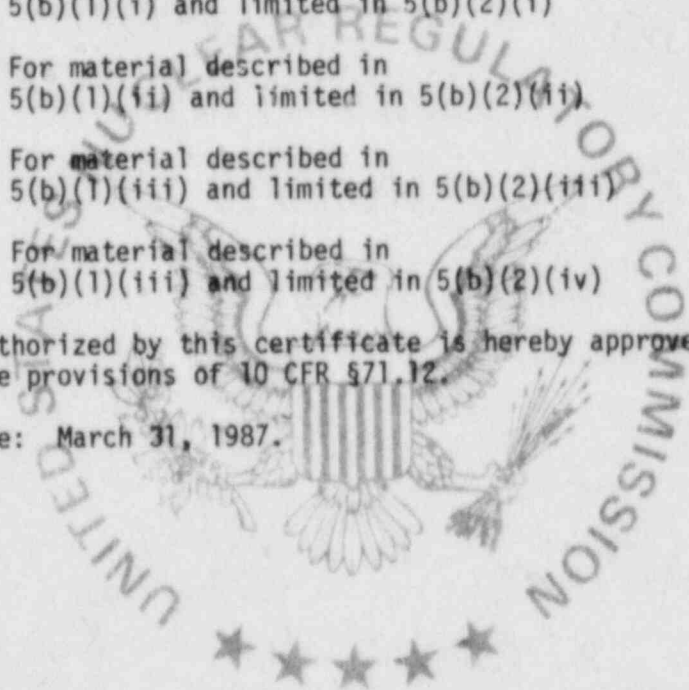
Page 3 - Certificate No. 6227 - Revision No. 1 - Docket No. 71-6227

(c) Fissile Class II and III

- (1) Minimum transport index to be shown on label for Class II.
 - (i) For material described in 5(b)(1)(i) and limited in 5(b)(2)(i) 1.1
 - (ii) For material described in 5(b)(1)(ii) and limited in 5(b)(2)(ii) 3.4
 - (iii) For material described in 5(b)(1)(iii) and limited in 5(b)(2)(iii) 0.1
 - (iv) For material described in 5(b)(1)(iii) and limited in 5(b)(2)(iv) 10.0
- (2) Maximum number of packages per shipment as Class III.
 - (i) For material described in 5(b)(1)(i) and limited in 5(b)(2)(i) 122
 - (ii) For material described in 5(b)(1)(ii) and limited in 5(b)(2)(ii) 37
 - (iii) For material described in 5(b)(1)(iii) and limited in 5(b)(2)(iii) 200
 - (iv) For material described in 5(b)(1)(iii) and limited in 5(b)(2)(iv) 10

6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.

7. Expiration Date: March 31, 1987.

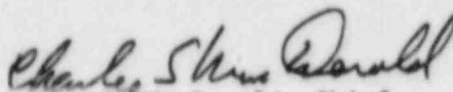


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REFERENCES

Oak Ridge Y-12 Plant report Nos. Y-DD-152, June 1974; Y-DD-153, July 1974 with revision per R. J. Fraser letter to report recipients dated July 17, 1974; Y-DD- 160, December 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 6244	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/6244/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc. application
dated May 14, 1984, as supplemented.

71-6244

c. DOCKET NUMBER

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.: CNS 4-85
- (2) Description

The package consists of a steel and lead shielded cask. The cask is positioned within an overpack constructed of steel and honeycomb material. The gross weight of the package is 46,000 pounds.

The mild steel cask is approximately 111-1/2 inches in length and 58 inches in diameter. The walls, top, and bottom are of 2-inch thick steel plate. Shielding is provided by 2 inches of lead within the walls and 2-inch thick steel walls of the cask. The cask lid is secured to the cask body by twenty-four, 3/4-inch diameter bolts and is sealed by a compressible polyurethane seal. Lifting devices are attached to the lid and body of the cask.

The cask is positioned within an overpack approximately 139-1/2 inches in overall length and 89-3/8 inches in diameter. Aluminum honeycomb material is confined by an outer steel shell 3/8-inch thick and an inner steel shell of 1/4-inch thickness. The overpack cover is of the same construction as the rest of the overpack and is secured to the walls by eight, 5/8-inch diameter bolts. Lifting devices are welded to the outer shell of the overpack cover.

(3) Drawings

The package is constructed in accordance with Nuclear Waste Systems Drawing No. D-6930-1, Rev. F (Sheet 1 of 2) and Chem-Nuclear Systems Drawing No. D-6930-1, Rev. E (Sheet 2 of 2).

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5. (b) Contents

(1) Type and form of material

(i) Greater than Type A quantity of byproduct material as process solids, either dewatered, solid, or solidified, in secondary container(s) which meet the requirements for DOT Specification 7A packaging; or

(ii) Greater than Type A quantity of byproduct material as solid metal components in secondary containers, as required.

(2) Maximum quantity of material per package

Not to exceed 10 thermal watts of byproduct material. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For packages to be delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of separation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. The lifting lugs on the outside of the overpack shall be covered during transport to prevent their accidental use for the purpose of tie-down or lifting.

8. Shoring shall be placed between the secondary containers (or activated components) and the cask cavity to minimize movement during normal conditions of transport.

Page 3 - Certificate No. 6244 - Revision No. 6 - Docket No. 71-6244

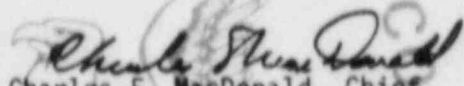
9. The lid polyurethane seal shall be replaced prior to final closure for each shipment.
10. Fabrication of additional packagings after August 31, 1984, is not authorized.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: August 31, 1989.

REFERENCES

Chem-Nuclear Systems, Inc. application dated May 14, 1984.

Supplement dated: August 3, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

AUG 28 1984

**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
6272	6	USA/6272/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Ecology
P.O. Box 7246
Louisville, KY 40207

Protective Packaging, Inc. application
dated June 24, 1974, as supplemented

71-6272

c. DOCKET NUMBER

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.: 6272

(2) Description

A protective overpack having a double-walled, low-carbon steel shell (3/16" outer wall and 20-gauge inside wall) with rigid polyurethane foam (nominally 7" thick) thermal-shock insulation between the walls. The edges of the overpack are reinforced with 10-gauge steel angles welded to the outer face of the walls and internal diagonal 14 gauge steel plates. Overpack lid closure is provided by three, 1" steel rods which extend the full width, welded to an end plate at one end and secured by a pin at the other end. Enclosed within the overpack is a bolted and gasketed, 12-gauge low carbon steel inner container. The gross weight of the package is about 6,100 pounds.

(3) Drawings

The overpack is constructed in accordance with Mechanics Research, Inc., Drawing No. 121347, revised to May 21, 1970. The waste M-3 steel bin (inner container) is constructed in accordance with Argonne National Laboratory's Drawing No. CS-2273.

Page 2 - Certificate No. 6272 - Revision No. 6 - Docket No. 71-6272

5. (b) Contents

(1) Type and form of material

- (i) Dry, solid radioactive material within the waste storage bin; or
- (ii) Liquid analytical residues from the dissolution of spent reactor fuel rods, solidified in cement (see table, p. 3 of application*). The cement is contained in 1.5-gal steel can closed with a slip cover lid. The two primary cans are packed in a secondary steel can sealed with a press fit lid (see Figure 2 of application*). The secondary containment package contents are placed within a radiation shield (lid secured with six (6), 1/2"-13UNC bolts with welds in accordance with application*) centered in a DOT Specification 17-C 55-gal steel drum (see Figure 1 of application*). The drum is sealed with styrene-butadiene rubber gasket contained with a standard drum closer and loaded into a M-3 steel bin with polyurethane foam dunnage material (Instapack 200, or equivalent).

* U.S. Department of Energy letter dated April 15, 1983.

(2) Maximum quantity of material per package

The maximum weight of the contents (including dunnage) shall not exceed 3,000 pounds, and:

For the contents specified in 5(b)(1)(i):

The thermal heat load shall not exceed 5 watts; or

For the contents specified in 5(b)(1)(ii):

The package is limited to 435 ci of mixed fission products and 12 g fissile material.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

Page 3 - Certificate No. 6272 - Revision No. 6 - Docket No. 71-6272

6. (continued)

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

- 7. Contents within the inner container must be either packed full or must be securely braced to prevent movement.
- 8. The cover of the inner container must be secured by at least 20 bolts (5 per side) of not less than 5/16-inch diameter.
- 9. Prior to each shipment the inner container lid gasket shall be inspected. The gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.
- 10. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.
- 11. Expiration date: March 31, 1985.

REFERENCES

Protective Packaging, Inc. application dated June 24, 1974.

Supplement dated: January 28, 1975.

U.S. Department of Energy, Chicago Operations Office, supplement dated: April 15, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety

Date: JUL 0 5 1984

**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
6273	5	USA/6273/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Allied Chemical Corporation
P.O. Box 430
Metropolis, IL 62960

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Allied-General Nuclear Services application
dated April 29, 1975, as supplemented.

c. DOCKET NUMBER

71-6273

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: 48A, 48X, 48F, and 48Y

(2) Description

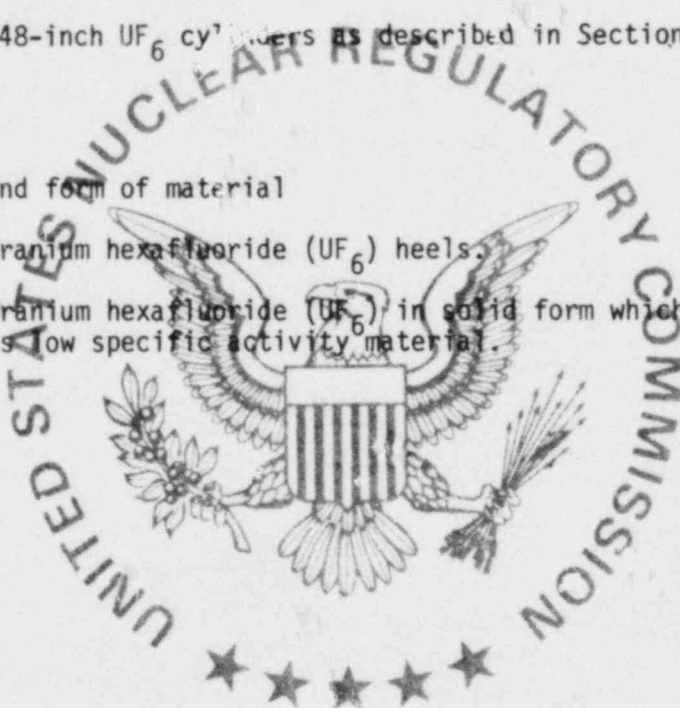
Metal 48-inch UF_6 cylinders as described in Section 7, ORO-651, Rev. 3.

(b) Contents

(1) Type and form of material

(i) Uranium hexafluoride (UF_6) heels.

(ii) Uranium hexafluoride (UF_6) in solid form which meets the requirements as low specific activity material.



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5. (b) Contents (continued)

(2) Maximum quantities of material per package

(i) For the contents described in 5(b)(1)(i):

Type A quantity of fissile radioactive material with a maximum U-235 enrichment, pounds UF₆, and U-235 content for the cylinder models as follows:

Model Number	Max. Enrichment w/o U-235	Max. UF ₆ Pounds	Max. U-235 kgs
48A, 84X 48F, 48Y	4.5	50.0	0.690

(ii) For the contents described in 5(b)(1)(ii):

Maximum U-235 enrichment, pounds UF₆, and U-235 content for the cylinder models as follows:

Model Number	Max. Enrichment w/o U-235	Max. UF ₆ Pounds	Max. U-235 kgs
48X, 48A	1.0	21,030	64.5
48F	1.0	27,030	82.9
48Y	1.0	27,560	84.5

(c) Fissile Class

For the contents described in 5(b)(1)(i) and limited in 5(b)(2)(i).

Fissile Class I

6. Valve protectors shall be provided as described in ORO-651, Rev. 3.
7. The fabrication, assembly, testing, maintenance, and use of packagings shall be in accordance with the requirements of ORO-651, Rev. 3. Tolerance dimensions for the Model No. 48-Y cylinder may be in accordance with Attachment I to Virginia Electric and Power Company letter dated December 20, 1976.
8. For the contents described in 5(b)(1)(ii) and limited in 5(b)(2)(ii) the package shall be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the shipper.

CONDITIONS (continued)

Page 3 - Certificate No. 6273 - Revision No. 5 - Docket No. 71-6273

9. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: November 30, 1985.

REFERENCES

Allied-General Nuclear Services application dated April 29, 1975.

Supplement dated: July 29, 1975.

Fissile Class I Shipment of Uranium Hexafluoride "Heel" Cylinders, K-L-6249, Rev. 1, June 5, 1974.

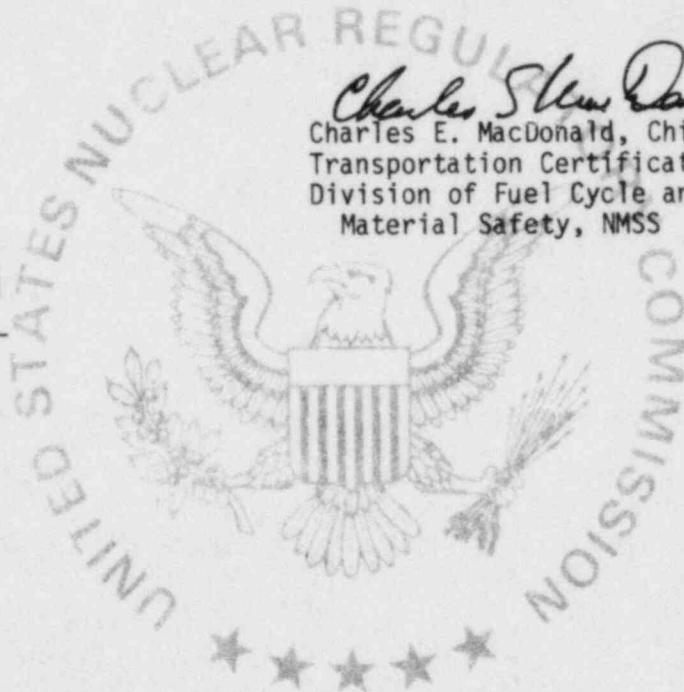
Uranium Hexafluoride Handling Procedures and Container Criteria, ORO-651, Rev. 3, August 1972.

Virginia Electric and Power Company supplement dated December 20, 1976.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER 6280	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/6280/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

J. L. Shepherd and Associates
740 Salem Street
Glendale, CA 91203

J. L. Shepherd and Associates application
dated September 5, 1979.

c. DOCKET NUMBER 71-6280

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.: A-0109 Irradiator in A-0117 Overpack

(2) Description

The packaging consists of an inner, lead-filled, steel weldment (Model A-0109 irradiator) enclosed within an outer protective enclosure (Model A-0117 overpack). The irradiator is a right cylinder, 31 inches diameter by 36 inches high, with a bolted top plug closure. The overpack is a double-walled steel cylinder enclosing a shock absorbing and thermal insulation core of glue-bonded layers of balsa wood (11 lbs/cu ft. density, 12 inches thick on the sides). The irradiator is held in place in the overpack by steel spacers attached to a 1/2-inch thick steel plate at each end. The void between the irradiator and inside wall of the overpack is filled with hardwood spacers. The overpack cover is secured by 30 5/8 inch diameter bolts. The dimensions of the package are 50.5 inches diameter by 73 inches long. The weight of the shielded irradiator is 7,000 lbs and the weight of the overpack is 3,400 lbs, totaling 10,400 lbs.

(3) Drawings

The overpack and irradiator are constructed in accordance with J. L. Shepherd and Associates Drawing Nos.: A-0109-A1, A-0109-10, A-0109-20, A-0117B, A-0117C, and A-0117-C1.

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5. (b) Contents

(1) Type and form of material

Cobalt 60 as cobalt wire encapsulated and heliarc welded in a stainless steel tube. The source is further encapsulated in an annular capsule approximately 6 inches in diameter by 6.43 inches long and sealed by heliarc welding. The cobalt 60 must meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

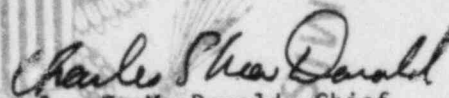
30,000 curies

6. The overpack must be modified by the addition of not less than 14 1/4-inch diameter vent holes in the outer shell (two each in the top cap and cap side, two in the bottom, and in two side tiers of 4 holes each, at 90° separation, with each tier located about one foot from each end). The holes must be sealed to prevent the inleakage of water but not so as to affect their capability of venting in the event of fire.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: November 30, 1984.

REFERENCE

J. L. Shepherd and Associates' application dated September 5, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

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
6294	8	USA/6294/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Combustion Engineering, Inc. Route 21-A Hematite, MO 63047	Combustion Engineering, Inc. application dated June 20, 1980, as supplemented. 71-6294

c. DOCKET NUMBER

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.: UNC-2901

(2) Description

A maximum 10.80-inch square by 30-inch long inner container constructed of minimum 14-gauge steel, with bolted and gasketed top flange closure and sealed welded bottom sheet. Inner container is centered and supported in a 22.5-inch ID by 34-inch high 18-gauge steel drum with 16-gauge head and DOT Specification 17H closure by asbestos sheet, plywood, hardboard, and insulating material. Gross weight of package - 660 pounds.

(3) Drawings

The packaging is constructed in accordance with Combustion Engineering, Inc. Drawing No. D-5007-8086, Rev. 3; or Babcock & Wilcox Company Drawing Nos. MS-135E, Rev. 3 and MS-82B, Rev. 0.

(b) Contents

(1) Type and form of material

Uranium dioxide as powder or sintered pellets. Uranium may be enriched to a maximum 4.1 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the inner container for powder or within the boundary of the pellet array for pellet packages, shall not exceed 4.5.

For the uranium contents specified in 5(b)(2)(iii), the maximum H/U considering all sources of hydrogenous material within the pellet box must not exceed 1.3 under normal conditions of transport.

For the uranium contents specified in 5(b)(2)(iv), the maximum weight of plastic bags containing UO₂ shall not exceed 600 grams per shipping container.

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(2) Maximum quantity of material per package

- (i) 427 pounds containing not more than 4.79 kgs U-235 as sintered pellets enriched to a maximum 3.75 w/o in the U-235 isotope, or 3.93 kgs U-235 as sintered pellets enriched to a maximum 4.1 w/o in the U-235 isotope. Pellets shall be packaged in accordance with Combustion Engineering, Inc. Drawing No. D-5008-8192, Rev. 5, or NFM-E-4266, Rev. 0.
- (ii) 230 pounds containing not more than 3.60 kgs U-235 as powder or sintered pellets packaged in accordance with United Nuclear Corporation Drawing No. A-5007-2011.
- (iii) 370 pounds containing not more than 6 kgs U-235 as sintered pellets enriched to a maximum of 4.1 w/o in the U-235 isotope. Pellets must be packaged in accordance with Babcock & Wilcox Drawing Nos. MS-157C, Rev. 3, and MS-84D, Rev. 2.
- (iv) Uranium dioxide as powder, pellets, or any combination thereof. Uranium may be enriched to a maximum 4.1 w/o in the U-235 isotope. Uranium must be packaged in accordance with Babcock & Wilcox Drawing Nos. MS-157C, Rev. 4, and MS-84D, Rev. 4.

(c) Fissile Class

II and III

For the contents specified in 5(b)(2)(i) and (ii):

- (1) Minimum transport index to be shown on label for Class II 2.0
- (2) Maximum number of packages per shipment for Class III 50

For the contents specified in 5(b)(2)(iii):

- (1) Minimum transport index to be shown on label for Class II 0.5
- (2) Maximum number of packages per shipment for Class III 150

For the contents specified in 5(b)(2)(iv):

- (1) Minimum transport index to be shown on label for Class II 1.0
- (2) Maximum number of packages per shipment for Class III 50

6. Prior to each shipment the insert (containment vessel) gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

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- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: July 31, 1985.

REFERENCES

Combustion Engineering, Inc., application dated June 20, 1980.

Supplement dated: September 9, 1981.

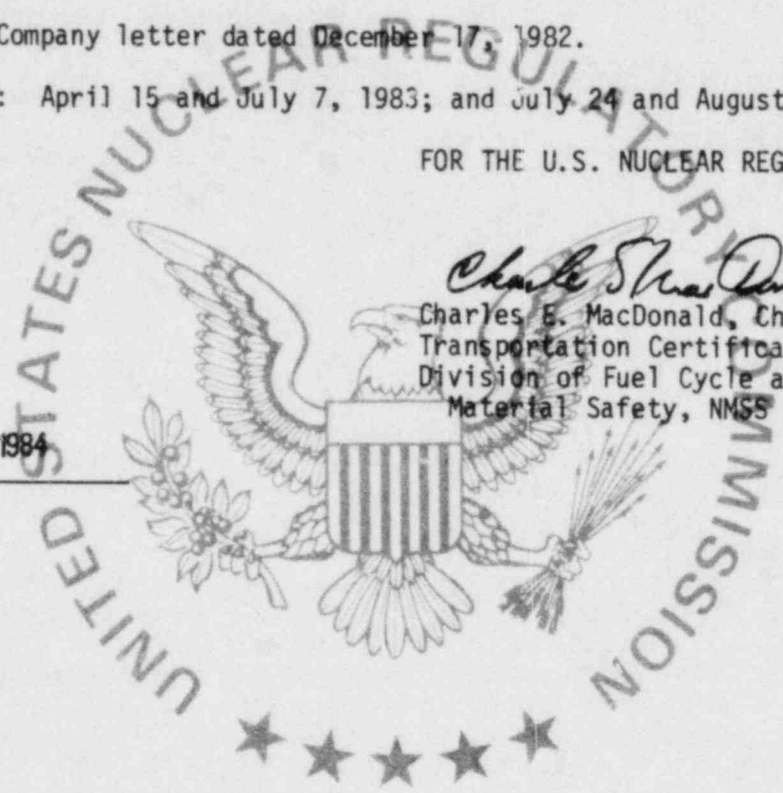
Babcock & Wilcox Company letter dated December 17, 1982.

Supplements dated: April 15 and July 7, 1983; and July 24 and August 30, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 24 1984



**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
6346	11	USA/6346/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

GA Technologies Company
P.O. Box 85608
San Diego, CA 92136

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Atomic Company application dated
August 28, 1980, as supplemented.

c. DOCKET NUMBER

71-6346

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.: FSV-1
- (2) Description

The cask is cylindrical, 208" long and 28" diameter for most of its length except for the top flange which is 11-3/8" thick and 31" in diameter. The cask utilizes stainless steel encased depleted uranium as primary shielding. The cask's inner container, for fueled contents, has a cavity of 16-5/8" diameter and 187-5/8" long. The fuel contents are hexagonal cross section elements and are loaded into the cask's inner container, six in one column. The cask may utilize either of two closure configurations. One closure system utilizes an outer cover consisting of 3-3/4" stainless steel together depleted uranium, 2-1/4" thick, and an inner lid of 2-1/4" thick stainless steel. The primary seal is provided by two O-rings, one metallic and the other silicone. The alternate closure system utilizes 4.75" thick alloy steel and 4.14" of depleted uranium. The alternate closure system requires the use of an impact limiter at the top during transport. The alternate closure is sealed by a molded dual concentric silicone elastomer seal ring with a test port between the seals. A gas sample port penetrates through the lid into the container. The gas test port is sealed with a check valve and primary plug with a silicone O-ring.

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5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with National Lead Company Drawing Nos.: 40065D, Rev. 1; 70085F, Rev. 5; 70086F, Rev. 7; 70094F, Rev. 5; and 70296F, Rev. 2.

The packaging with its alternate closure system utilizes the above drawings except that closures with impact limiter are constructed as shown on General Atomic Company Drawing Nos. GADR 55-2-1, Issue A; GADR 55-2-2, Issue A; and GADR 55-2-3, Issue A.

(b) Contents

(1) Type and form of material

- (i) Irradiated fuel elements consisting of graphite body, hexagonal in horizontal cross section, approximately 31.2 inches high and 14.2 inches across the flats. Each fuel element prior to irradiation contains thorium and uranium enriched to a maximum of 93.5 w/o in the U-235 isotope; or
- (ii) Solid nonfissile irradiated and contaminated hardware and neutron source components.

(2) Maximum quantity of material per package

Not to exceed a decay heat generation of 4.1 kw and:

(i) Item 5(b)(1)(i) above:

Six fuel elements each containing 1.4 kg of enriched uranium and 11.3 kg of thorium prior to irradiation and weighing 300 lbs;

(ii) Item 5(b)(1)(ii) above:

As needed, appropriate component spacers must be used in the cask cavity to limit movement of contents during shipment.

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(c) Fissile Class	III
Maximum number of packages per shipment	Contents 5.(b)(1)(i): One (1)

6. The alternate closure system must be leak tested prior to (1) first use and periodically in accordance with Section I.G.2 and (2) each use in accordance with Section I.G.1, to Addendum I, Revision 1, General Atomic Company Safety Analysis Report GADR-55.
7. The spent fuel container main flange seal(s) and the alternate closure system fuel container primary plug silicone O-ring must be replaced at least every 12 months.
8. For the contents of Item 5(b)(1)(ii), the use of a 1/8" thick close fitting steel burial liner provided with a steel shield ring as shown in GA Technologies, Inc. Drawing Nos. GADR 55-2-10, Issue B, and GADR 55-2-11, Issue A or B is authorized. The use of additional shielding attached to the inside of the liner cylindrical shell is not authorized except for the shielded burial canister shown on GA Technologies, Inc. Drawing No. GADR 55-2-9, Issue B. When the shield ring is fabricated from carbon steel, the dose rate on the surface of the package must not exceed 200 mr/hr. (For the purpose of this requirement, the surface of any personnel barrier may not be considered the surface of the package.)
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: September 30, 1985.

REFERENCES

General Atomic Company application dated August 28, 1980.

Supplements dated: September 18, 1981; and March 23, May 10 and 11, and July 27, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard
for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 6347	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/6347/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

GA Technologies, Inc.
P.O. Box 81608
San Diego, CA 92136

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Atomic Company application dated
February 19, 1982, as supplemented.

c. DOCKET NUMBER

71-6347

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.: FSV-3
- (2) Description

Inner container is a 18.5" ID x 34" high, 18-gage steel drum. Inner container is centered and supported in a 22.5" ID x 38.25" high, 16-gage steel drum. Void spaces between the inner and outer container and within the inner container are filled with vermiculite. Total weight, including contents, is 500 pounds.

(3) Drawing

The packaging is constructed in accordance with General Atomic Company Drawing No. FFE-613, Issue D.



Page 2 - Certificate No. 6347 - Revision No. 5 - Docket No. 71-6347

5. (b) Contents

(1) Type and form of material

Fuel element consisting of a graphite body, hexagonal in transverse cross-section approximately 14.2" across the flats and 31.2" high. Disposed in columns within the fuel element body there is a maximum 1.41 kg U-235 plus U-238 and Th-232. The U-235: U-238: Th-232 atomic ratio is about 1:0.07:8.3. The atomic ratio of carbon to the U-235 is in the range of 1800 to 1.

(2) Maximum quantity of material per package

One fuel element containing not more than 1.41 kg U-235 and weighing not more than 320 pounds.

(c) Fissile Class

II and III

(1) Minimum transport index to be shown on label for Class II

1.3

(2) Maximum number of packages per shipment as Class III

100

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

7. Expiration date: April 30, 1987.

REFERENCE

General Atomic Company application dated February 19, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 6357	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/6357/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Babcock & Wilcox Company P.O. Box 785 Lynchburg, VA 24505	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Babcock & Wilcox application dated September 8, 1970, as supplemented. 71-6357
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c. DOCKET NUMBER

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.: NNFD-10
 - (2) Description
Packaging as described and constructed in accordance with DOT Specification 6M except that the outside drum must have a capacity of at least 55 gallons.
 - (b) Contents
 - (1) Type and form of material
Uranium metal, alloys or compounds. Uranium may be enriched to any degree in the U-235 isotope.
 - (2) Maximum quantity of material per package
Contents shall not exceed 100 pounds, and the U-235 content shall not exceed 350 grams.
 - (c) Fissile Class II and III
 - (1) Minimum Transport index to be shown on label for Class II 2.1
 - (2) Maximum number of packages per shipment for Class III 48

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6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: October 31, 1989.

REFERENCES

Babcock & Wilcox application dated September 8, 1970.

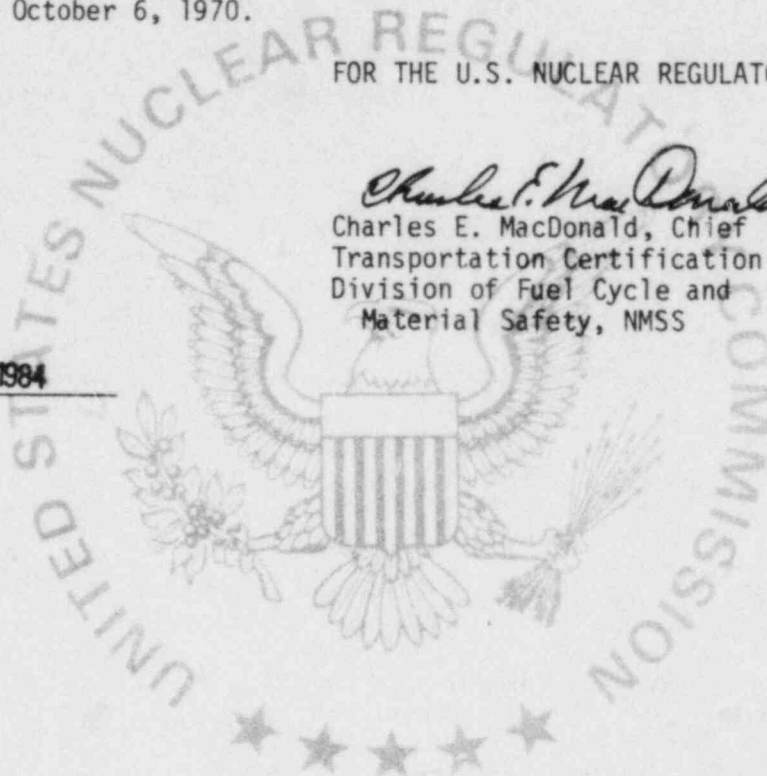
Supplement dated: October 6, 1970.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 24 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 6385	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/6385/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for SLW Unirradiated
Core shipping container dated July 7, 1969,
as supplemented.

c. DOCKET NUMBER 71-6385

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.: SLW Unirradiated Core
- (2) Description

The SLW Unirradiated Core shipping container is a sealed vessel pressurized to 5 to 7 psig with dry nitrogen and having an approximate length of 18 feet and outside diameter of 53 inches. The barrel of the vessel is fabricated from 2-inch thick carbon steel plate having outside diameter flanges of 60 inches. The barrel is 16 feet 1-1/4 inches long which is capped by a bottom barrel extension and a top cover. The bottom barrel extension is bolted to the barrel subassembly to cover and support the lower end of the core cartridge during shipment. A 2-inch thick steel bottom cover is bolted to the underside of the barrel extension to prevent possible puncture of the container through the inspection port in the underside of the barrel extension. The top bell cover is bolted to the barrel subassembly to seal the upper end of the container. The container is supported in a horizontal attitude within a shipping structure during shipment. The shipping structure is a fabricated steel structure of girders and steel angles and employs a rubber-type mounting for the support of the shipping container. The core cartridge is shipped with a full complement of design control rods installed. The control rods are restrained in the core by a control rod hold-down plate. The gross weight of the loaded shipping container is 45,200 lbs. This weight is exclusive of the 7,800 lbs. of the shipping structure.

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(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 902J139, Rev. D; 937F322, Rev. 4 and 937F346, Rev. 6.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type,

- (i) S1W fuel core with design control rods installed and restrained in the core by a control rod holddown plate
- (ii) S2W fuel core with design control rods installed and restrained in the core by a control rod holddown plate.

(2) Maximum quantity of material per package

One fuel assembly as described in 5(b)(1)(i) or 5(b)(1)(ii).

(c) Fissile Class

III

Maximum number of packages per shipment:

One

6. Expiration date: April 30, 1988.

REFERENCES

Safety Analysis Report for S1W Unirradiated Core shipping container, WAPD-OP(R)S-3403 dated July 7, 1969.

Supplements: Bettis Atomic Power Laboratory letters WAPD-OP(R)RD-407 dated September 4, 1970; WAPD-OP(R)RD-451 dated October 13, 1970 and WAPD-OP(R)RD-470 dated October 23, 1970.

FOR THE U. S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
6386	8	USA/6386/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

Safety Analysis Report for 235R001
Shipping Container dated August 11, 1970,
as supplemented.

c. DOCKET NUMBER 71-6386

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.: 235R001
- (2) Description

The 235R001 shipping container structure is horizontal, having an oblong cross section and is fabricated from 0.104-inch thick carbon sheet steel. The container is 313 inches long and has a maximum weight of 4,640 pounds, empty. The oblong cross section dimensions are approximately 35.5 inches high by 33.0 inches wide. The container was originally designed to ship unirradiated fuel modules of the A1G/A4W type. Subsequently, the container has been adapted to ship A1W-3 fuel modules using a strongback, partial A1W-R3 fuel modules using module support assemblies, standard size or partial S8G fuel modules by use of a special frame assembly and cradle clamps, S3G-3 refueling modules using cell support assemblies, rodDED or unrodDED D1G fuel modules, rodDED ASNPP fuel cells and rodDED or unrodDED D2W fuel cells. The loaded container maximum weight is 12,421 pounds.

(3) Drawings

The packaging is constructed in accordance with Container Research Corporation Drawing Nos. 235R001, Rev. C, 235R004, Rev. C, and 235R005, Rev. 0, and Westinghouse Electric Corporation Drawing Nos. 973D425, Rev. 1, 903E693, Rev. 3, Sheet 1, 2 and 3 of 3, and 947J076, Rev. 0.

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(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type,

- (i) A1G and A4W reactor cell without upper mechanism and with control rod, leadscrew and shipping fixture installed on rodded type modules.
- (ii) A4W Reactor Test Assembly (RTA).
- (iii) A1W-3 module without upper mechanism and with control rod, leadscrew, and control rod holddown device installed on rodded type modules.
- (iv) A1W-R3 Partial Lower Module.
- (v) Standard size S8G reactor cluster with regular or substitute support adapters and regular control rods or Boral poison rods with control rod holddown devices installed. If only one cell is shipped per container, a dummy load shall be installed for balance.
- (vi) Partial size S8G reactor cluster with regular or substitute support adapters and regular control rods or Boral poison rods with control rod holddown devices installed. If only one cell is shipped per container, a dummy load shall be installed for balance.
- (vii) S3G-3 refueling cells, with a maximum of one O-1 reactor cell assembly per container.
- (viii) D1G fuel module, rodded.
- (ix) D1G removable fuel assembly (RFA), unrodded.
- (x) A1G fuel cluster, fueled end only of full A1G reactor cell, rodded.
- (xi) ASNPP fuel cell with control rod, and control rod holddown device installed.
- (xii) D2W side or central fuel cells with control rod and control rod holddown device.
- (xiii) D2W corner fuel cells, unrodded.

(2) Maximum quantity of material per package

- (i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii) or 5(b)(1)(xi).

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(2) Maximum quantity of material per package (Cont'd.)

(ii) Two fuel assemblies as described in 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(x), 5(b)(1)(xii) or 5(b)(1)(xiii).

(iii) Four fuel assemblies as described in 5(b)(1)(ix).

(c) Fissile Class

III

Maximum number of packages per shipment:

(1) For the contents described in 5(b)(1)(iii) and limited in 5(b)(2)(i):

18

(2) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(ix), 5(b)(1)(x), 5(b)(1)(xi), 5(b)(1)(xii), and 5(b)(1)(xiii) and limited in 5(b)(2)(i), 5(b)(2)(ii), and 5(b)(2)(iii):

4

6. Commingling of packages for Fissile Class III shipment is authorized provided that the sum of the ratios of the number of packages of an individual type to be shipped to the maximum allowable number of packages of that type per shipment does not exceed unity.

7. Expiration date: January 31, 1988.



CONDITIONS (continued)

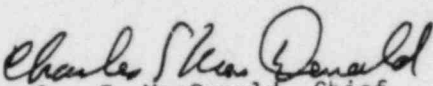
Page 4 - Certificate No. 6386 - Revision No. 8 - Docket No. 71-6386

REFERENCES

Safety Analysis Report for 235R001 Shipping Container, WAPD-OP(R)RD-357 dated August 11, 1970.

Supplements: Knolls Atomic Power Laboratory letter AIG 25-159; dated October 2, 1970, Bettis Atomic Power Laboratory letters WAPD-OP(R)RD-444; dated October 9, 1970, WAPD-OP(R)RD-476; dated October 26, 1970, and WAPD-OP(R)RD-488; dated October 30, 1970, Knolls Atomic Power Laboratory letters AIG 25-181; dated April 9, 1971, and AIG 25-191; dated May 11, 1971, Bettis Atomic Power Laboratory letters WAPD-OP(R)C-94; dated May 16, 1972, WAPD-OP(R)C-199; dated December 13, 1972, and WAPD-OP(R)C-229; dated March 6, 1973, Naval Reactors letters G#5078; dated January 26, 1976, G#5776; dated September 8, 1977, G#5905; dated January 23, 1978, G#5923; dated February 22, 1978, G#6095; dated August 17, 1978, G#6208; dated March 8, 1979, G#6373; dated September 4, 1979, and G#6813; dated October 17, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Dated: SEP 06 1983

U.S. NUCLEAR REGULATORY COMMISSION

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 6387	b. REVISION NUMBER 9	c. PACKAGE IDENTIFICATION NUMBER USA/6387/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 5
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c. 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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address) Battelle Pacific Northwest Laboratories Battelle Boulevard Richland, WA 99352	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION Battelle Pacific Northwest Laboratories application dated June 2, 1980.
c. DOCKET NUMBER 71-6387	

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.: Model 60
- (2) Description

A metal "birdcage" enclosing a steel containment vessel for non-irradiated fuel pins. The stainless steel containment vessel is a 6-inch diameter, 101-1/4-inch long, Schedule 40 pipe. One end is closed with a 1-inch thick cover plate, bolted with eight, 3/4-inch diameter bolts to a welded, 150-pound, neck type flange. The gasket is a Flexitallic type, spiral wound, stainless steel, asbestos filter. The cover plate is fitted with a rupture disk assembly designed for up to 300 psi.

The containment vessel is centered inside a metal "birdcage" (18" x 18" x 112.5", prismatic, cage frame made of 1-1/2" x 1-1/2" x 1/4" angle iron), supported by six, 0.189-inch steel welded perpendicular to its longitudinal axis and equally spaced along its body and by four Schedule 80 stainless steel pipe spokes at each end. The outer spacer cage is covered with expanded steel mesh. The loaded container weight is approximately 1,000 pounds.

5. (a) Packaging (Continued)

(3) Drawings

The packaging is constructed in accordance with Hanford Engineering Development Laboratory Drawing Nos. H-3-32429 (Sheets 1 and 2, Rev. 12; Sheet 3, Rev. 8; Sheet 4, Rev. 4; Sheet 5, Rev. 1; Sheets 6 and 7, Rev. 0); H-3-42514, Rev. 0; H-3-39691, Sheet 1, Rev. 1 and Sheet 2, Rev. 0; and H-3-44280, Rev. 0.

(b) Contents

(1) Type and form of material

- (i) Nonfissile radioactive material, in capsules which meet the requirements of special form radioactive material.
- (ii) Unirradiated fuel pins containing mixed PuO_2 in depleted or natural UO_2 or ThO_2 as pressed sintered pellets of the following specification:

Pellet diameter, inch	0.19 to 0.21
Pin diameter, inch	0.22 to 0.24
Maximum fuel length, inches	37
Maximum PuO_2 , w/o	31
Maximum U-235 enrichment, w/o	0.72
Minimum Pu-240 enrichment, w/o	10
Maximum Pu-241 content	< 1/2 content of Pu-240
Cladding material	SS
Minimum cladding thickness, inch	0.015

- (iii) Unirradiated fuel pins containing mixed PuO_2 in UO_2 enriched to any degree in the U-235 isotope; ThO_2 may be substituted for depleted or natural UO_2 ; plutonium or uranium carbides and nitrides are allowed. All of the above as solid pellets of the following specifications:

Maximum pin diameter, inch	0.60
Maximum fuel length, inch	37
Minimum Pu-240 enrichment in PuO_2 , w/o	10
Maximum Pu-241 content	< 1/2 content of Pu-240
Cladding material	SS
Minimum cladding thickness, inch	0.010

- (iv) PuO_2 and UO_2 enriched in the U-235 isotope in fuel pins or capsules which meet the requirements of special form radioactive material.
- (v) U-233 in any solid physical or chemical form with any moderation in capsules which meet the requirements of special form radioactive material.

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- (vi) Np-237 and Am-241 in any solid physical or chemical form with any moderation in capsules which meet the requirements of special form radioactive material.
- (vii) Pu-241 (in isolated form), Am-242, Cm-243, Cm-244, Cm-245, Cf-249 and Cf-251 in any solid physical or chemical form with any moderation in capsules which meet the requirements of special form radioactive material.
- (viii) Pu-241 (non-isolated form), Pu-238, Pu-239, Pu-240 and U-235 in any solid physical or chemical form; provided the Pu-241 content of the plutonium does not exceed 50% of the Pu-240 content in capsules which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

The maximum package heat load shall not exceed 12.3 watts/ft of fuel length with the maximum package heat load not to exceed 37.0 watts, and plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements; and:

- (i) For the contents described in 5(b)(1)(ii), 120 fuel pins. For the contents described in 5(b)(1)(iii) and constrained in appropriate pin holders as shown in drawings specified in 5(a)(3), the maximum fissile density shall not exceed 2.0 kg/ft for PuO₂ in UO₂ over a maximum length of 37 inches of the package.
- (ii) For the contents described in 5(b)(1)(iv): Greater than Type A quantity of radioactive material and fissile material contents not to exceed the generally licensed mass limits as specified in 10 CFR §71.22.
- (iii) For the contents described in 5(b)(1)(v): 230 grams.
- (iv) For the contents described in 5(b)(1)(vi): 15 kgs total.
- (v) For the contents described in 5(b)(1)(vii): 3 grams total.
- (vi) For the contents described in 5(b)(1)(viii): 900 grams fissile.

(c) Fissile Class II and III

(1) Minimum transport index to be shown on label for Class II.

- (i) For contents described in 5(b)(1)(ii) and limited in 5(b)(2)(i): 0.4.

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5. (continued)

(c) Fissile Class (continued)

- (ii) For contents described in 5(b)(1)(iii) and limited in 5(b)(2)(i): 7.0
- (iii) For contents described in 5(b)(1)(v) and limited in 5(b)(2)(iii): 1.3
- (iv) For contents described in 5(b)(1)(vi) and limited in 5(b)(2)(iv): 0.2
- (v) For contents described in 5(b)(1)(vii) and limited in 5(b)(2)(v): 0.6
- (vi) For contents described in 5(b)(1)(viii) and limited in 5(b)(2)(vi):

<u>Maximum grams fissile per container</u>	<u>Transport Index</u>
150	0.1
500	1.3
900	7.0

(2) Maximum number of packages per shipment for Class III

Contents described in 5(b)(1)(iv) and limited in 5(b)(2)(ii): One

- 6. For mixtures of isotopes specified in 5(b)(1)(viii) and 5(b)(1)(v) and limited in 5(b)(2)(vi), 5(c)(1)(vi), 5(b)(2)(iii) and 5(c)(1)(iii) the sum of the ratios of the content masses to their respective approved mass limits shall not exceed unity.
- 7. For the contents specified in 5(b)(1)(iii) and 5(b)(1)(ii) and limited in 5(b)(2)(i) and 5(c)(1)(ii) nitrides and carbides may be shipped under the same limits as oxides. The fuel pins shall be positioned in a stainless steel pin holder providing a close packed 5.7-inch diameter array, and:
 - (a) For pin holders containing between 58 and 120 pins in stainless steel tubes the minimum tube wall thickness shall be 0.035 inches;
 - (b) For pin holders containing between 35 and 57 pins in stainless steel tubes, the minimum tube wall thickness shall be 0.050 inches.
- 8. The packaging shall be equipped with a FIKE Assembly Number 1/2SP10A rupture unit having a muffled outlet, 304 SS body, and nickel rupture disc to burst at less than 300 psi.

Page 5 - Certificate No. 6387 - Revision No. 9 - Docket No. 71-6387

- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: July 31, 1985.

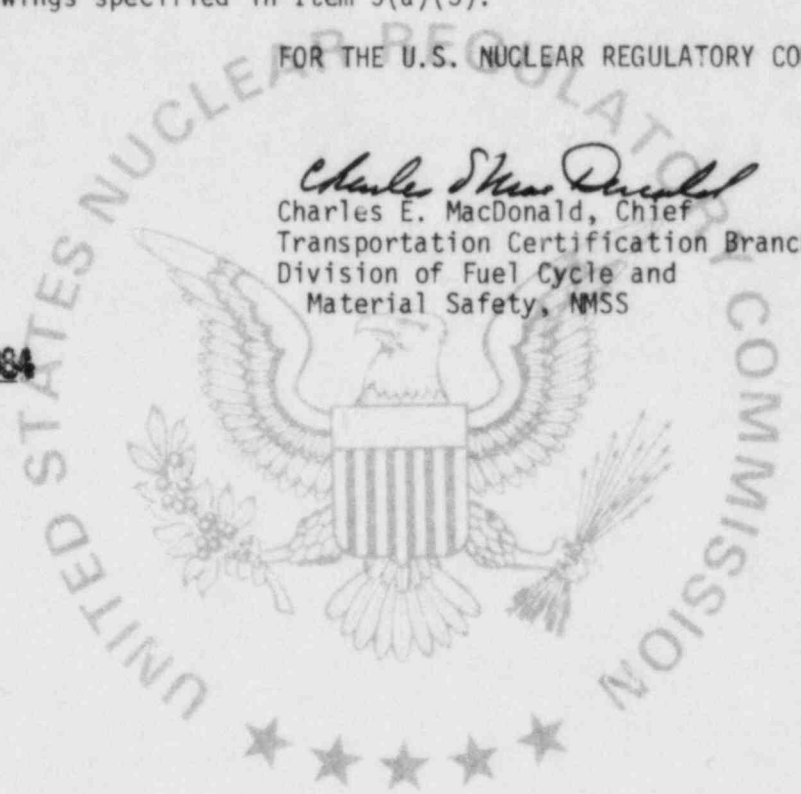
REFERENCE

Battelle Pacific Northwest Laboratories' application dated June 2, 1980, and legible copies of all drawings specified in Item 5(a)(3).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, M55

Date: FEB 09 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 6400	b. REVISION NUMBER 17	c. PACKAGE IDENTIFICATION NUMBER USA/6400/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 8
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230

Westinghouse Electric Corporation application
dated August 7, 1981, as supplemented.

c. DOCKET NUMBER **71-6400**

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.: 6400

(2) Description

A protective overpack which provides impact and thermal protection for its contents. The inner shell (cavity) is approximately 76" x 76" x 172" constructed of 3/16" thick and 10-gauge mild steel. Closure of the cavity is by a 1/4" thick aluminum plate with silicone rubber gasket which is bolted to the main inner shell. The cavity is centered and supported in an outer 3/16" thick steel jacket by approximately 32" of polyurethane foam insulation at the end and 10" on the sides. A removable section or cap consisting of approximately 34" of polyurethane foam insulation encased in steel with a silicone rubber gasket is bolted to the main outer steel jacket. The overall dimensions of the package are approximately 8' x 8' x 20'. Vent holes are provided on the sides and ends of the container. Set into each corner of the outer container are standard I.S.O. steel castings. The total weight including weight of the contents is 45,000 pounds.

(3) Drawings

Packaging is constructed in accordance with one of the following sets of drawings: (1) Protective Packaging, Inc, Drawing Nos. 32106, Sheet 1, Rev. F and 32106, Sheet 2, Rev. 0; or (2) Westinghouse Electric Corporation Drawing No. 2020D08, Sheet 1 and 2, Rev. 0; or (3) Babcock and Wilcox Company Drawing No. 11-D-2130, Rev. 0; or (4) Protective Packaging, Inc., Drawing Nos. 32106-1, Sheet 1, Rev. F and 32106, Sheet 2, Rev. 0, as modified by Nuclear Packaging Inc. Drawing No. EG-60-01D, Sheets 1 and 2, Rev. 0; or (5) Protective Packaging, Inc. Drawing No. 32395, Sheets 1 through 9, Rev. B, as modified by Sandia Laboratories letter dated May 8, 1980; or (6) Lawrence Livermore National Laboratory Drawing Nos. AAA81-108683-00, Rev. 0 and AAA81-110194-00, Rev. 0.

Page 2 - Certificate No. 6400 - Revision No. 17 - Docket No. 71-6400

(b) Contents

- (1) Large, decontaminated equipment waste of such size as not to fit into a 55-gallon drum (with legs or other readily removable appendages removed). Not to exceed 200 grams plutonium within the package.

Equipment waste surfaces containing more than 0.5 Ci must be decontaminated to a smearable level of no more than 150,000 dpm/100 cm² prior to fixation or until successive decontamination cleaning operations do not reduce the smearable contamination levels by more than ten percent. After fixation, equipment waste surfaces must have a smearable level of contamination of no greater than 10,000 dpm/100 cm². Outer surfaces must have a smearable level of contamination of no greater than 20 dpm/100 cm². Prior to fixing of contamination, large equipment waste must be inspected to insure that: (a) all sharp or protruding objects have been removed, blunted or protected with packaging material, and (b) pipe caps, gasketed blind flanges, covers, etc., have been installed wherever possible. Following such inspection, the inner surfaces containing more than 0.5 Ci must be fixed with "strip" or "clear" coating. The inner surface(s) may alternatively be fixed with a polyurethane foam.

The large equipment waste must be enclosed in a tight-fitting, 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); or enclosed in a tight fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1, and 908E619, Rev. 2 or 908E648, Rev. 0 or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the equipment and the box must be filled with foam (1" minimum foam thickness) and between equipment (1/2" minimum foam thickness).

Alternatively, gloveboxes contaminated and fixed as described above may be broken down as follows:

Glovebox windows are removed and separately packaged in 12-mil thick PVC bags and sealed. The inner bag is tape sealed and the outer bag is heat sealed.

Glovebox panels are cut to dimensions to fit inside the 3/16" thick corrugated steel burial crates constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). All sharp or protruding objects are removed, blunted, or protected with packaging material. The glovebox panels are bundled such that internal box surfaces are facing inward. Cut glovebox panels from not more than one glovebox are banded with metal strap banding such that two metal strap bands in each direction are placed around the length and width of the glovebox sections. The glovebox window and cut panel packages are enclosed and foamed in place within the box.

Page 3 - Certificate No. 6400 - Revision No. 17 - Docket No. 71-6400

Blocking or dunnage is placed within the box to ensure a one inch foam barrier on the sides and bottom of the box. Likewise, dunnage is provided between the banded glovebox sections to maintain a 1/2" thick foam barrier between banded packages.

- (2) Decontaminated hard waste items, such as equipment, metal cans, tools, etc., must be double bagged within 12-mil thick PVC with each bag heat sealed. The total fissile quantity of all the sealed packages in one container must not exceed 200 grams.

Hard waste surfaces must be decontaminated to a smearable level of no more than 150,000 dpm/100 cm² prior to fixation or until successive decontamination cleaning operations do not reduce the smearable contamination levels by more than 10 percent. After fixation, hard waste surfaces must have a smearable level of contamination of no greater than 10,000 dpm/100 cm². Prior to fixing of contamination, hard waste must be inspected to insure that sharp or protruding objects have been removed, blunted, or protected with packaging material. Following such inspection, the outer surfaces must be fixed with "strip" or "clear" coating. Hard waste items such as furnace shells, muffles, or other items with large cavities not accessible for decontamination must be filled with foam within the cavities. Surfaces that are not easily accessible, e.g., interiors of small diameter tubing and piping which were in contact with process materials, must have been swabbed or immersed in cleaning solution to insure removal of residual material. Open ends of the tubing and piping must be sealed using mechanical fittings.

Alternately, large heavy walled process glassware must be painted inside and outside to fix contamination and double bagged in 12-mil thick PVC with each bag heat sealed. The glassware must be secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-4, Rev. 0. The box must be filled with foam and total activity limited to less than two (2) Ci in a box.

Alternately, stainless steel transfer tubes and HEPA filters must be double bagged in 12-mil thick PVC with each bag heat sealed. The tubes/filters must be secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-28, Rev. 0. The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

Alternately, round steel ducting must be capped and secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-29, Rev. 0; 272E81-30, Rev. 0; or 272E81-31, Rev. 0. Outer surfaces ducting will have a smearable level of contamination no greater than 20 dpm/100 cm². The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

Sealed packages and boxes of hard waste must be enclosed in a tight-fitting, 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); enclosed in a tight fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1 and 908E619, Rev. 2 or 908E648, Rev. 0 or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the packages and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between the sealed packages must be filled with foam (1/2" minimum foam thickness).

- (3) Glove box absolute (HEPA) filters must be double bagged within 12-mil thick PVC, with each bag heat sealed and packaged within DOT Specification 17H or 17C steel drums (maximum size of 55 gallons). Each drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

Sealed drums must be enclosed in a tight-fitting 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); enclosed in a tight fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1 and 908E619, Rev. 2, or 908E648, Rev. 0, or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

- (4) Soft waste items such as sheeting, gloves, paper, prefilter media, polyethylene bottles, shoe covers, etc., must be double bagged in 12-mil thick PVC, with each bag heat sealed (bag size must not exceed 22" x 16" x 10") and packaged within DOT Specification 17H or 17C steel drums (maximum size of 55 gallons). Each drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

Sealed drums must be enclosed in a tight-fitting 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

Page 5 - Certificate No. 6400 - Revision No. 17 - Docket No. 71-6400

- (5) Liquid waste (decontamination solutions only) must be solidified in concrete in a 30-gallon drum which must be sealed in a plastic bag and centered and supported in a DOT Specification 17H or 17C 55-gallon steel drum by absorbent material. The 55-gallon drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

Alternatively, liquid waste is solidified in concrete in maximum size one (1) gallon packages which are double bagged and heat sealed in 12-mil thick PVC and placed with a DOT Specification 17H or 17C steel drum (maximum size of 55 gallons). The drum is lined with a sealed plastic liner and equipped with a standard drum closure. Each 55-gallon drum must not exceed a fissile quantity of 60 grams. For drums smaller than 55-gallons, the total fissile quantity of all the sealed packages (drums) in one container must not exceed 200 grams.

Sealed drums must be enclosed in a tight-fitting 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; or a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); enclosed in a tight-fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1 and 908E619, Rev. 2 or 908E648, Rev. 0 or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

- (6) Uranium 233 oxide and thorium oxide in the form of intact LWBR-type fuel rods with the following limitations:
- (i) Rods must be packaged within the Model No. 6400 packaging as described in Section 1 of WAPD-LP(FE)-220, Rev. 3 (February 1983);
 - (ii) The fuel content must not exceed 50 kg U-233 per shipment;
 - (iii) All rod storage containers must be filled to capacity (at least 70% of cross-sectional area) with rods or aluminum shim stock;
 - (iv) Each rod storage container must contain not more than one sub-container of 5/9 or 12 w/o BMU seed rods;
 - (v) Each rod storage container must weigh not more than 2,000 pounds;
 - (vi) The fuel rod heat generation must not exceed 30 watts; and
 - (vii) Operating Procedures and Acceptance Tests and Maintenance Program must be modified to meet the requirement of Item 11 of this approval.

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- (7) Liquid analytical residues from the dissolution of spent reactor fuel rods, solidified in cement (see table, p. 3 of application*). The cement is contained in 1.5-gal steel can closed with a slip cover lid. The two primary cans are packed in a secondary steel can sealed with a press fit lid (see Figure 2 of application*). The secondary containment package contents are placed within a radiation shield (lid secured with six (6), 1/2"-13UNC bolts with welds in accordance with application*) centered in a DOT Specification 17-C 55-gal steel drum (see Figure 1 of application*). The drums are sealed with styrene-butadiene rubber gasket contained with a standard drum closer. Total weight of the drum will be less than 1,450 lb, and each drum will not exceed a fissile quantity of 12 g and 435 Ci of fission products.

Six (6), 55-gal sealed drum assemblies will be enclosed in a tight-fitting 3/16-in thick corrugated steel box constructed in accordance with Rockwell-Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be fitted with foam to a minimum thickness of 1/2 inch. Two (2) corrugated steel box assemblies may be transported in the packaging.

* U.S. Department of Energy letter dated April 15, 1983.

- (8) Uranium 233 oxide and thorium oxide in the form of intact LWBR-type fuel rods with the following limitations:
- (i) Rods must be packaged as shown in Figure 4, Application dated July 3, 1983, and contained within the Model No. NNFD-SA-2 packaging (Certificate of Compliance No. 5910);
 - (ii) The fuel content must not exceed 2.0 kg U-233 per shipment;
 - (iii) Each loaded LWBR Rod Transport Box must weigh not more than 99 pounds;
 - (iv) The fuel rod heat generation rate must not exceed 2 watts; and
 - (v) Operating Procedures and Acceptance Tests and Maintenance Program must be modified to meet the requirement of Item 11 of this approval.

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(9) Maximum of four (4) Cf-252 sources with the following limitations:

- (i) Each source must be doubly encapsulated with the inner capsule meeting the requirements for special form radioactive material;
- (ii) The total Cf-252 content must not exceed 6.1 mg;
- (iii) The sources must be packaged in a shielded container as described in Chapter 1 of WAPD-LP(CE) 00-591 (January 1984); and
- (iv) The decay heat generation from the source material must not exceed one watt.

(c) Fissile Class	III
Maximum number of packages per shipment	One (1)

6. The polyurethane foam must be Instapak 200, or equivalent.
7. The maximum weight of the contents including secondary packaging, dunnage, shoring and bracing must not exceed 30,000 pounds.
8. Sufficient dunnage, shoring and/or bracing must be utilized to minimize secondary impact of the secondary packaging within the cavity under accident conditions.
9. Protrusions from secondary packaging such as lifting eyes, etc., must be positioned such that they will not contact the cavity walls, or shoring must be provided to prevent puncture of the cavity walls by the protrusions under the accident conditions.
10. Contents must be positioned in the cavity such that the center of gravity of the loaded package is substantially the same as the center of gravity of an empty package.
11. The cavity of the overpack must be vented through an absolute filter to equalize pressure between the outside and inside of the overpack.
12. Package Model No. 6400 is exempt from the requirements of 10 CFR §71.63 only for the purpose of making these shipments.
13. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
14. Expiration date: November 30, 1986.

Page 8 - Certificate No. 6400 - Revision No. 17 - Docket No. 71-6400

REFERENCES

Westinghouse Electric Corporation application dated August 7, 1981.

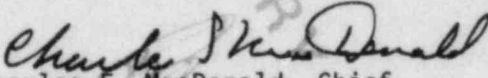
General Electric Company supplement dated: October 1, 1981.

Babcock and Wilcox Company supplement dated: March 8, 1982.

U.S. Department of Energy, Division of Naval Reactors, supplements dated: April 22, and July 8, 1983; and March 5, 1984.

U.S. Department of Energy, Chicago Operations Office, supplement dated: April 15, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: MAR 23 1984

**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
6406	5	USA/6406/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Energy Research and Development
Administration Application dated
July 19, 1977, as supplemented.

c. DOCKET NUMBER

71-6406

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.: None specified

(2) Description

Specific packaging is not required. Safety is independent of packaging.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following types:

- (i) S5G Fuel Experiment Assembly (FEA) in the Model No. FEA shipping container.
- (ii) S5G Double Fuel Experiment Assembly (DFEA) in the Model No. DFEA shipping container.
- (iii) A1W-3 Removable Uninstrumented Subassembly (RUS) in the Model No. 25.0 shipping container.
- (iv) A1W-3 Prototype "A" Module or A1W-3 Shipboard "A" Module in the Model No. 2.7/3.6 shipping container.

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(b) Contents (Continued)

- (v) Rodded instrumented SIC fuel module in the Model No. 7481E12 shipping container.
- (vi) SIC fuel module or SIC peripheral assembly in the Model No. SIC bird cage shipping container.
- (vii) S1W-3 Removable Subassembly (RSA) in the Model No. S1W RSA/Metal Box.
- (viii) S5W-2 Removable Subassembly (RSA) in the Model No. S5W RSA/Bird Cage.
- (ix) S5W-R2/R3 or S5W-2 module in the Model No. S5W New Module Container.
- (x) A1W-2/R2 cluster or half cluster in the Model No. 658C shipping container.
- (xi) S3G-2A/2B fuel module in the Model No. 7481E12 or Model No. 9SK218 shipping container.
- (xii) D2W rodDED fuel cell or unrodDED corner type D2W fuel module in a Model No. 658H1A shipping and storage container. RodDED type fuel module shall have a control rod and control rod holddown device installed.
- (xiii) S7G unit cell or reactor cell assembly in a Model No. 658E1AB shipping and storage container, with shipping clamp installed.
- (xiv) Advanced Test Core (ATC) welded fuel cluster or ATC cage assembly fuel cluster in a Model No. 660B1/660C1 container.
- (xv) D1G fuel module in a model 572A1 or 572B1 shipping container and D1G Removable Fuel Assembly (RFA) in a Model No. 573A1 or 573B1 shipping container. A control rod and control rod holddown device need not be installed in the D1G fuel module.
- (xvi) D1G Removable Fuel Assembly (RFA) in a Model No. 573A1 or 573B1 shipping container.
- (xvii) PWR Core 1 (Seed 2, 3 or 4) unrodDED seed fuel assembly or PWR Core 2 (Seed 1 or 2) unrodDED seed fuel assembly, in unspecified shipping containers.
- (xviii) PWR Core 1 (Seed 2, 3 or 4) unrodDED seed fuel subassembly or PWR Core 2 (Seed 1 or 2) unrodDED seed fuel subassembly, in unspecified shipping containers.
- (xix) S8G rodDED fuel cell in unspecified shipping container with control rod holddown device installed.
- (xx) S5G type unit cell in a Model No. 658E1AB shipping container.

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(xix) A1W-3 Prototype Peripheral Subassembly or A1W-3 Prototype Center Subassembly in the Model No. 2.7/3.6 shipping container.

(xxii) S7G Partial Fuel Cell Subassembly in a DOT specification (Type 20 WC-3) container.

(2) Maximum quantity of material per package

(i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(ix), 5(b)(1)(x), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), 5(b)(1)(xv), 5(b)(1)(xvi), 5(b)(1)(xvii), 5(b)(1)(xviii), 5(b)(1)(xix), 5(b)(1)(xx), and 5(b)(1)(xxii).

(ii) Two fuel assemblies as described in 5(b)(1)(xv).

(iii) Three fuel assemblies as described in 5(b)(1)(xxi).

(c) Fissile Class

III

Maximum number of packages per shipment:

- | | |
|---|-----------|
| (1) For the contents described in 5(b)(1)(ii), 5(b)(1)(iv), 5(b)(1)(vi), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), 5(b)(1)(xv), 5(b)(1)(xvii), 5(b)(1)(xix), 5(b)(1)(xx), 5(b)(1)(xxi), and 5(b)(1)(xxii), and limited in 5(b)(2)(i), 5(b)(2)(ii) and 5(b)(2)(iii): | 1 (one) |
| (2) For the contents described in 5(b)(1)(iii), 5(b)(1)(v), 5(b)(1)(ix), 5(b)(1)(x) or 5(b)(1)(xviii) and limited in 5(b)(2)(i): | 2 (two) |
| (3) For the contents described in 5(b)(1)(i) and 5(b)(1)(viii) and limited in 5(b)(2)(i): | 3 (three) |
| (4) For the contents described in 5(b)(1)(vii) and limited in 5(b)(2)(i): | 4 (four) |
| (5) For the contents described in 5(b)(1)(xvi) and limited in 5(b)(2)(i): | 8 (eight) |

6. Commingling of packages for Fissile Class III shipment is authorized provided that the sum of the ratios of the number of packages of an individual type to be shipped to the maximum allowable number of packages of that type per shipment does not exceed unity.

7. Expiration date: June 30, 1988.

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REFERENCES

U.S. Energy Research and Development Administration application dated July 19, 1977.
Supplements: Department of Energy letters G#5868; dated January 4, 1978, with enclosures, #6291; dated July 13, 1979, and G#7609; dated September 30, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: FEB 29 1984

**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
6441	3	USA/6441/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
U.S. Department of Energy Division of Naval Reactors Washington, DC 20585	Safety Analysis Report for D2G Power Unit Shipping Container dated August 4, 1969, as supplemented.
	c. DOCKET NUMBER 71-6441

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.: D2G Power Unit
- (2) Description

The D2G Power Unit shipping container assembly consists of five main assemblies; (1) the barrel assembly, (2) the upper cover, (3) the lower cover, (4) the main shipping skid, and (5) the barrel trunnion supports. To prepare the power unit shipping container for shipment of a power unit, the container barrel is rotated to the vertical position, the upper cover is removed and the power unit is loaded into the barrel and secured in the container with eight (8) shipping studs. The upper cover is then installed and the container is rotated to the horizontal position for shipment. The container assembly is 31 feet long and 8-1/2 feet wide and it is attached to a government owned permanently assigned depressed center railroad car; the maximum height above the rails is 13 feet, 10 inches in the shipping configuration. The power unit is shipped complete with design control rods and mechanisms installed.

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(2) Description (continued)

The closure head in a Type A and Type B power unit contains an integral bolting flange. This type of power unit is retained in the container by means of eight shipping bolts which clamp the power unit to the barrel upper flange of the shipping container. The control rods in a Type A or B power unit are restrained in the power unit by means of control rod holddown latch pawls located in the upper control rod drive mechanism. The Type C, D, and E power unit is also retained in the container by means of eight shipping bolts but because the closure heads on these power units do not include a bolting flange, a special shipping ring is used to clamp the closure head and core cartridge assembly to the barrel upper flange of the shipping container. The control rods in a Type C, D, or E power unit are restrained in the power unit by means of rebound and outmotion latches located in the latching portion of the control rod drive mechanisms. The container assembly weighs about 100,000 pounds empty and about 270,000 pounds loaded.

(3) Drawings

The packaging is constructed in accordance with Baldwin-Lima-Hamilton Corporation Drawing Nos. R-126361, Rev. E and R-126347, Rev. K and Westinghouse Electric Corporation Drawing Nos. 955F632, Rev. 5 and 972D940, Rev. 5.

(b) Contents

(1) Type and form of material

Unirradiated enriched uranium as contained in Naval Reactors Type A, B, C, D, or E power units consisting of core barrel, unirradiated fuel assemblies, closure head, mechanisms and associated hardware, with all design control rods and mechanisms installed.

(2) Maximum quantity of material per package

One power unit as described in 5(b)(1).

(c) Fissile Class

III

Maximum number of packages per shipment

one (1)

6. Expiration date: February 29, 1988.

Page 3 - Certificate No. 6441 - Revision No. 3 - Docket No. 71-6441

REFERENCES

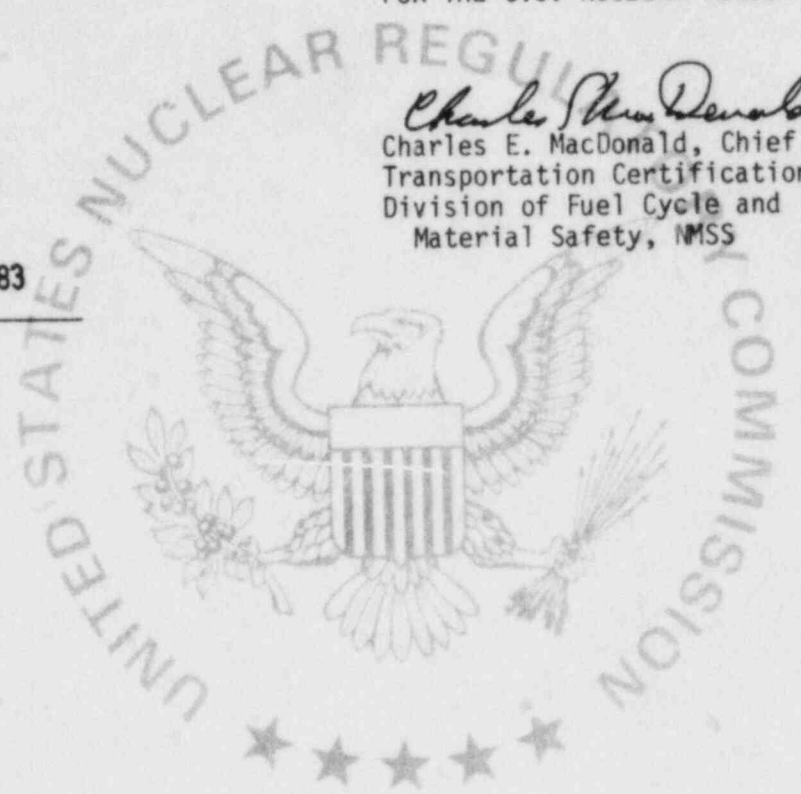
Safety Analysis Report for D2G Power Unit Shipping Container, ONP-74252-13 dated August 4, 1969.

Supplements: Bettis Atomic Power Laboratory letters WAPD-DP(CH)-1252; dated November 30, 1973, WAPD-DP(CH)-1466; dated October 18, 1974, and Knolls Atomic Power Laboratory letter CGN 85542-250; dated February 5, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 6458	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/6458/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 780
Wilmington, NC 28401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Electric Company application dated
January 7, 1972, as supplemented.

c. DOCKET NUMBER **71-6458**

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.: BU-5

(2) Description

Two, 5-gallon or three, 2.5-gallon, 11.25-inch ID, Minimum 24 gauge steel pails contained in a 13.75-inch diameter by 27-inch long inner container constructed of minimum 18-gauge steel, with bolted and gasketed top flange closure. Inner container is centered and supported in a 22.5-inch ID, 18-gauge steel 55-gallon capacity DOT Specification 17H steel drum by solid insulation cushioning material. Maximum gross weight is 420 pounds.

(3) Drawing

The packaging is constructed in accordance with Figure 1.6.1 of General Electric Company application dated January 7, 1972.

Page 2 - Certificate No. 6458 - Revision No. 4 - Docket No. 71-6458

5. (b) Contents

(1) Type and form of material

- (i) Uranium oxide powder with a maximum bulk density of 2.3 grams/cc. Uranium may be enriched to a maximum 5.0 w/o in the U-235 isotope. The maximum H/U atomic ratio considering all sources of hydrogenous material within the inner container must not exceed 0.45.
- (ii) Uranium oxide as pellets with a maximum bulk density of 10.96 grams/cc. Uranium may be enriched to a maximum 5.0 w/o in the U-235 isotope. The maximum H/U atomic ratio considering all sources of hydrogenous material within the inner container must not exceed 0.45.
- (iii) Uranium compounds enriched not more than 4.0 w/o which, together with any other associated materials, do not decompose at temperatures up to 210°F, and of bulk density not greater than 10.96 grams per cc at any H/U-235 ratio.

(2) Maximum quantity of material per package

- (i) For the contents described in 5(b)(1)(i): The maximum contents per package, divided between two, 5-gallon pails or three 2.5-gallon pails must be limited in accordance with the following table:

Maximum U-235 enrichment, w/o	Maximum oxide per pail, kgs	Maximum oxide per package, kgs
3.0	44.5	89.0
3.2	38.9	77.8
3.4	34.6	69.2
3.6	31.1	62.2
3.8	28.3	56.6
4.0	25.7	51.4
4.2	23.7	47.4
4.4	21.9	43.8
4.6	20.2	40.4
4.8	19.1	38.2
5.0	18.1	36.2

- (ii) For the contents described in 5(b)(1)(ii): The maximum contents per package divided between two, 5-gallon pails or three, 2.5-gallon pails must be limited in accordance with the following table:

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Maximum U-235 enrichment, w/o	Maximum UO ₂ per pail, kgs	Maximum UO ₂ per package, kgs
2.7	45.0	90.0
2.8	42.9	85.8
2.9	40.1	80.2
3.0	38.1	76.2
3.2	34.1	68.2
3.4	31.0	62.0
3.6	28.5	57.0
3.8	26.4	52.8
4.0	24.7	49.4
4.2	22.9	45.8
4.4	21.4	42.8
4.6	20.0	40.0
4.8	18.8	37.6
5.0	18.1	36.2

(iii) For the contents described in 5(b)(1)(iii): Two 5-gallon pails with not more than 24.7 kilograms per pail.

(c) Fissile Class I

6. The four, 1/4-inch diameter holes located near the top of the outer DOT Specification 17H steel drum must be covered with weatherproof tape to preclude the entry of water.
7. For mixtures of the contents described in Items 5(b)(1)(i) and 5(b)(1)(ii), the maximum quantity of material per package must be limited to the quantity given in Item 5(b)(2)(ii).
8. For the packaging described in Item 5(a)(3), the density of the insulation may not be less than 0.42 gram/cc.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: April 30, 1986.

Page 4 - Certificate No. 6458 - Revision No. 4 - Docket No. 71-6458

REFERENCES

General Electric Company application dated January 7, 1972.

Supplements dated: April 14, May 12, and August 1, 1972.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Odegaard
for

Charles E. MacDonald, Chief
Transportation Certification Branch
Office of Fuel Cycle and
Material Safety, NRC

Date: NOV 25 1983



**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
6478	2	USA/6478/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Lawrence Livermore Laboratory
University of California
Livermore, CA 94550

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Packaging: Neutron
Shipping Cask, Model 4T, Report No. UCRL-52232,
March 4, 1977, as supplemented.

c. DOCKET NUMBER 71-6478

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.: 4T
- (2) Description

Packaging for special form neutron source material. The container is a right circular cylinder mounted to a 54-inch by 54-inch square steel pallet. The container consists of a 41-inch diameter by 48.5-inch high 1/4-inch thick steel shell filled with gypsum-spodumene. A 16-inch diameter by 23-1/2-inch deep central cavity is provided by a steel shell. Positive closure of the gypsum-spodumene filled steel, rubber sealed container cover is provided by twelve (12), 1-inch diameter stud bolts. Containment is provided by special form capsules which may be held and supported within the capsule rack. The package gross weight is 5,100 pounds.

(3) Drawings

The packaging is constructed in accordance with Lawrence Livermore Laboratories Drawing Nos.: AAA60-414963-0F, AAA60-414964-0F, AAA60-414965-0B, AAA70-100076-0A, AAA68-120276-00, AAA60-414966-0B, AAA59-414690-0D, AAA59-414676-0B, AAA59-414917-0C, AAA59-414679-00, AAA59-414811-00, AAA59-414682-00, AAA59-414630-00, AAA59-414686-00, AAA59-414916-00, AAA59-414688-00, AAA59-414918-00, AAA59-414677-0A, AAA59-414685-00, AAA59-414683-00, AAA59-414678-00, AAA59-414684-00, AAA68-118940-0A, AAA59-414689-0A and AAA69-108511-0C.

Page 2 - Certificate No. 6478 - Revision No. 2 - Docket No. 71-6478

(b) Contents

(1) Type and form of material

Mixtures of solid or powdered material in capsules which meet the requirements of special form radioactive material. Mixtures may contain any of the following isotopes: Am-241, Am-242m, Am-243, Cm-242, Cm-243, Cm-244, Cm-245, Cm-246, Cm-247, Cm-248, Cm-250, Bk-249, Cf-249, Cf-250, Cf-251, Cf-252, Cf-253, Es-253, Es-254, Es-255, Fm-254, Fm-257, Pu-238, Pu-239, Pu-241, U-233 and U-235.

(2) Maximum quantity of material per package

Not to exceed 250 watts, and the mass of the following isotopes, in any combination, not to exceed 15 grams: Am-242m, Cm-243, Cm-245, Cm-247, Cf-249, Cf-251, U-233, U-235, Pu-238, Pu-239 and Pu-241.

6. Contents shall be limited such that the dose rate 3 feet from the bare capsule assembly shall not exceed 1,000 mrem/hr.
7. Spacers and shoring shall be provided in the container cavity sufficient to prevent significant movement that could damage the contents under accident conditions of 10 CFR Part 71.
8. The packaging authorized by this certificate is hereby approved under general license provisions of 10 CFR §71.12.
9. Expiration date: October 31, 1984.

REFERENCES

Lawrence Livermore Laboratory Report No. UCRL-52232, March 4, 1977.

Lawrence Livermore Laboratory letter to C. D. Jackson, USDOE, San Francisco Operations Office, May 18, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegaard

got Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 06 1983

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER 6550	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/6550/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

University of California
Lawrence Berkeley Laboratory
Berkeley, CA 94720

Report No. LBL-2168, February 1974,
as supplemented.

c. DOCKET NUMBER 71-6550

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.: 6-GS-1

(2) Description

Shielded packaging for sealed source. An outer gypsum-spodumene filled cask with 1/4-inch thick steel walls, 24-inch OD, and 34-inch overall height which includes a 34-inch square steel pallet base. The outer cask has a bolted plug closure. The inner cavity is 11 inches diameter by 15 inches deep, containing a sealed source within a nestable stainless steel and depleted uranium gamma shield assembly; or within an internal mounting rack. Package gross weight is 1,840 pounds; or 1,230 pounds when the inner nested gamma shield assembly is not used.

(3) Drawings

The packaging is fabricated in accordance with Lawrence Radiation Laboratory Drawing Nos.:

HCD 56952A	HCD 61081A	HCD 60604A
HCD 58291	HCD 60081	8J8573D
HCD 60061	HCD 60091	8J8583A
HCD 60071	HCD 60596D	8J8684E
HCD 61076	HCD 63464A	13J6212A

(b) Contents

(1) Type and form of material

- (i) Radioactive material contained within capsules which meet the requirements of special form radioactive material.
- (ii) Radium-226 in the form of radium bromide (RaBr_2) encased in a 1 mm thick monel shell and held within a 1.575-inch diameter beryllium container.

Page 2 - Certificate No. 6550 - Revision No. 3 - Docket No. 71-6550

5. (b) Contents (continued)

(2) Maximum quantity of material per package

- (i) The contents described in 5(b)(1)(i) must not exceed 5,000 curies of radioactive material, 15 grams fissile material and 243 watts internal decay heat, except that the total mass for any of the following isotopes must not exceed:

Am-242	6.0g	Cm-245	0.5g
Am-242m	0.2g	Cm-244	10 g
Am-241	115 g	Cm-243	3.0g
Cf-252	85 g	Cm-242	2.0g
Cf-251	0.06g	Cm-240	338 g
Cf-250	20 mg	Es-255	200 g
Cf-249	0.4g	Es-254	700 mg
Cf-248	10 mg	Es-253	270 mg
Cm-250	20 mg	Fm-257	100 g
Cm-248	5 g	Np-237	40 g
Cm-247	2.4g	Pu-240	150 g
Cm-246	20 g		

- (ii) The contents described in 5(b)(1)(ii) must not exceed 1 Ci.

6. For mixtures of isotopes described in 5(b)(1)(i) and limited in 5(b)(2)(i), the sum of the ratios of the content isotope masses to their respective approved mass limits must not exceed unity.
7. The contents described in 5(b)(1)(ii) and limited in 5(b)(2)(ii) must be centered and supported within a 3.75-inch OD by 5.375-inch high DOT SPEC 2R Container. The filler material must be vermiculite.
8. The packaging authorized by this certificate is hereby approved under general license provisions of 10 CFR §71.12.
9. Expiration date: July 31, 1988.

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REFERENCES

University of California, Lawrence Berkeley Laboratory, Report No. LBL-2168, February 1974.

Department of Energy Supplement dated: October 4, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: DEC 19 1983

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
6553	2	USA/6553/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Union Carbide Corporation
P.O. Box 1410
Paducah, KY 42001

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report on the "Paducah Tiger"
Protective Overpack for 10-Ton Cylinders of Uranium
Hexafluoride, Report No. KY-665, June 16, 1975, and
Supplement 1 dated May 20, 1977.
71-6553

c. DOCKET NUMBER

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.: Paducah Tiger
- (2) Description

A protective overpack which provides impact and thermal resistance for the Model Nos. 48A or 48X 10-ton cylinders. The cylinders are welded steel, and are 48 inches in diameter, 121 inches long, and have 5/8-inch thick walls. The cylinders each have a 108.9 ft³ volume, and are rated at 200 psig service pressure. The protective overpack has overall dimensions of approximately 153 inches x 76 inches x 72 inches. The overpack consists of two parts, a body and a lid, which are clamped and secured by four, 1-3/8-inch ratchet type binders, and eight 1-3/4-inch guide pins, fitted with 3/4-inch high-strength latch pins. The closed, assembled overpack consists of an outer 1/8-inch steel shell backed on both long sides, top and bottom by two, 10-gauge stainless steel breakaway plates. The valve end is protected by a 3/8-inch stainless steel breakaway plate. A centrally located 3/16-inch steel shell, 60 inches in diameter x 128 inches long is separated from the outer shell by fire retardant polyurethane foam. The cylinder is held in the overpack by rubber shock isolators. Four mild steel brackets are provided on the body for lifting. The four ISO corner fittings on each of the lid and body sections may be used for lifting. Four, 2-inch bolts are used in conjunction with the ISO corner fittings for tie-down. The package gross weight is 37,500 pounds.

Page 2 - Certificate No. 6553 - Revision No. 2 - Docket No. 71-6553

(3) Drawings

The Paducah Tiger overpack is constructed in accordance with Protective Packaging, Inc. Drawing Nos. 32301, Rev. B and 32302, Rev. B; and Union Carbide Corporation Drawing Nos. EM-1209-A, Rev. 3; EM-1209-B, Rev. 6; EM-1209-C, Rev. 5; EM-1209-D, Rev. 5; EM-1209-E, Rev. 2; EM-1209-F, Rev. 4; EM-1209-G, Rev. 2; EM-1209-H, Rev. 2; and EM-1209-J, Rev. 1.

The Model Nos. 48A and 48X cylinders are constructed in accordance with Oak Ridge Gaseous Diffusion Plant (ORGDP) Drawing No. D-P35721GR2 and specifications in USAEC Oak Ridge Operations Office Report No. ORD-651, Rev. 3.

(b) Contents

(1) Type and form of material

Solid uranium hexafluoride (UF_6) at not more than 4.5% U-235 isotope enrichment, and an H/U ratio of no more than 0.088.

(2) Maximum quantity of material per package

The maximum weight of UF_6 not to exceed 21,030 pounds (9,540 kg). The maximum U-235 content not to exceed 619 pounds (280 kg).

(c) Fissile Class

I

6. The fabrication, assembly, testing, maintenance and use of the Model Nos. 48A and 48X cylinders shall be in accordance with the requirements of USAEC, Oak Ridge Operations Office Report No. ORD-651, Rev. 3.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: June 30, 1988.

REFERENCES

Safety Analysis Report on the "Paducah Tiger" Protective Overpack for 10-Ton Cylinders of Uranium Hexafluoride, Union Carbide Corporation Report No. KY-665, June 16, 1975, and Supplement I, May 20, 1977.

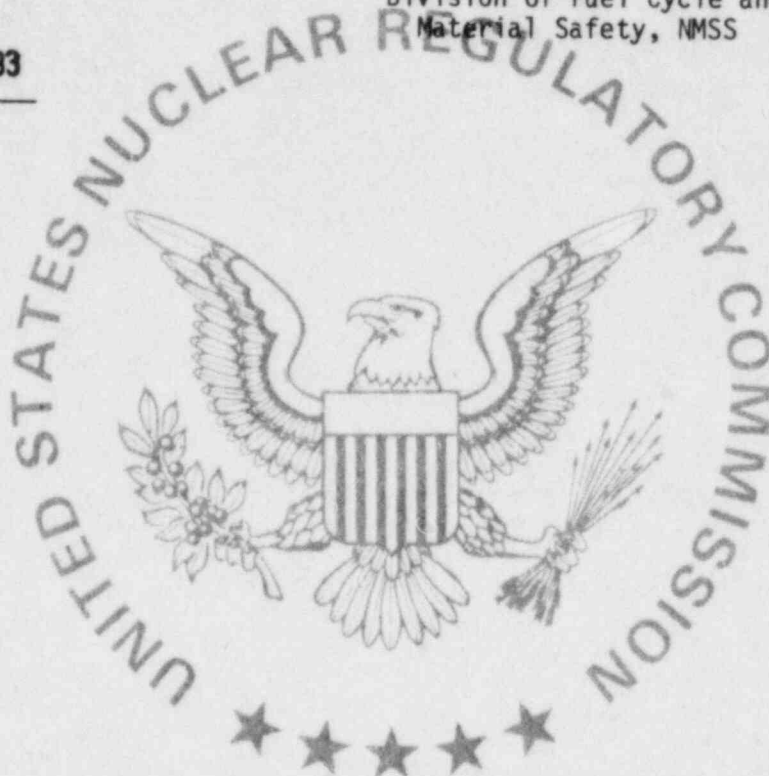
Page 3 - Certificate No. 6553 - Revision No. 2 - Docket No. 71-6553

Uranium Hexafluoride Handling Procedures and Container Criteria, USAEC Oak Ridge Operations Office Report No. ORO-651, Rev. 3, August 1972.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date SEP 06 1983



**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
6568	5	USA/6568/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Tennessee Valley Authority
400 Chestnut Street, Tower II
Chattanooga, TN 37401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Tennessee Valley Authority application dated
August 16, 1976, as supplemented.

c. DOCKET NUMBER

71-6568

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.: LL-60-150

(2) Description

The cask is cylindrical in shape 93 inches long and 82.5 inches in diameter. Lead shielding, 3-1/2 inches thick, is encased within the inner and outer steel shells that are welded to a laminated steel base plate assembly. The cover is a steel plate assembly secured to the top flange by 36 steel bolts. Encircling the top of the cask is a partial length steel shell of 1/2-inch thickness. Silicone O-rings provide seals at the top cover and at all plugs. The inner container is a right circular steel cylinder with a capacity of 150 cu ft. The total weight, when loaded, is approximately 73,000 pounds.

(3) Drawings

The packaging is constructed in accordance with the following ATCOR Inc. Drawing Nos.: 0568-B-0005, Rev. H; 0568-C-0008, Rev. E; 0568-B-0010, Rev. E; 0568-B-0016, Rev. D; 0568-B-0018, Rev. A; 0568-B-0025; 0568-R-0001, Rev. J.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid, or solidified waste, meeting the requirements for low specific activity material in sealed containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the package contents and secondary containers not exceeding 12,500 pounds.

Page 2 - Certificate No. 6568 - Revision No. 5 - Docket No. 71-6568

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
7. Operating procedures must be followed to assure that:
- (i) All threaded pipe plugs in the cask and liner are sealed, using an appropriate sealant.
 - (ii) The space between the liner (drums) and cask cavity is dry prior to delivery to a carrier for transport.
 - (iii) Dunnage shall be provided in the shipping cask cavity sufficient to prevent significant movement of the secondary container(s) relative to the outer packaging under normal conditions.
 - (iv) Prior to each shipment the silicone O-ring lid gasket must be inspected. This gasket must be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.
8. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: April 30, 1986.

Page 3 - Certificate No. 6563 - Revision No. 5 - Docket No. 71-6568

REFERENCES

Tennessee Valley Authority application dated August 16, 1976.

Supplements dated: October 8, 1976; October 5, 1979; and October 23, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaarden

for

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6574	13	USA/6574/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Westinghouse Hittman Nuclear Incorporated 9151 Rumsey Road Columbia, MD 21045	Hittman Nuclear and Development application dated December 10, 1979, as supplemented.

c. DOCKET NUMBER 71-6574

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.: HN-200

(2) Description

The packaging consists of a steel-lead-steel annulus cask fabricated in the form of a right circular cylinder and three different types of inner containers. The shielded cask, closed at one end and a lid closure at the other, is 66.25 inches in diameter by 74.5 inches in height. The cask wall consists of a 3/8-inch inner steel shell, 3-3/4 inches of lead shielding, one-inch outer steel shell, and a steel flange connecting the two shells. The cask outer shell is surrounded by a one-inch layer of insulating material and canned in 14-gauge steel.

The lid, sealed by a Viton O-ring, is of similar construction and is bolted to the cask body. A cylindrical shield plug is located in the center of the cask lid and is sealed by a Viton O-ring. Lifting and tie-down devices are attached to the cask body and impact skirts, consisting of removable rings of shock absorbing foam, are attached to the ends of the cask. The cask may be provided with an optional bottom pan.

(3) Drawing

The package is fabricated in accordance with the following Hittman Nuclear and Development Corp. Drawing Nos.: C001-5-9200, Sheets 1 through 6, Revision J; and SK-82-020, Rev. 3.

Page 2 - Certificate No. 6574 - Revision No. 13 - Docket No. 71-6574

5. (b) Contents

(1) Type and form of material

The package contents consist of radioactive wastes. These solids include spent ion exchange resins, filter sludges, solidified evaporator concentrates, spent fuel cartridges, and contaminated or irradiated solid materials.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits specified in 10 CFR §71.53. The cask contents must be contained within one of the following inner containers and limited as follows:

- (a) Single disposable cylindrical containers constructed of metal or high integrity plastic with tightly fitted covers. A maximum decay heat load of 205 Btu/hr.
- (b) Two pallets with four, 30-gallon drum size containers per pallets. Drums to be constructed of metal or high integrity plastic with a tightly fitted cover. A maximum decay head load of 84 Btu/hr.
- (c) One pallet with three, 55-gallon drum size containers. Drums to be constructed of metal or high integrity plastic with tightly fitted covers. A maximum decay heat load of 116 Btu/hr.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

Page 3 - Certificate No. 6574 - Revision No. 13 - Docket No. 71-6574

7. The total weight of the package must not exceed 48,000 pounds and the weight of the contents (including dunnage, etc.) must not exceed 10,675 pounds.
8. Except for close fitting contents, sufficient dunnage, shoring, and/or bracing must be utilized to minimize secondary impact of the contents within the cavity under accident conditions of transport.
9. Prior to each shipment, the Viton O-ring seal on the main cover and the seal on the shield plug cover, if opened, or if the security seal is broken, must be inspected. The seals must be replaced if the inspection shows any visible defects or every twelve (12) months, whichever occurs first.
10. If the optional pan shown in Drawing No. SK-82-020 is utilized, the void between the pan and bottom impact limiter side wall must be filled with Flexane 80, or equivalent, caulking material such that water will not be retained with the cask in an upright position. The pan must be removed annually (beginning with first use) and the pan and impact limiter surfaces cleaned to less than 2,200 DPM/100 cm² beta-gamma and less than 220 DPM/100 cm² alpha and the caulking replaced with new material. Prior to each shipment, the caulking material must be inspected and any cracks, splits, or tears in the caulking material or separation of the material from any of its adhering surfaces repaired in accordance with written operating procedures.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: March 31, 1985.

REFERENCES

Hittman Nuclear and Development Corporation application dated December 10, 1979.

Supplements dated: March 20, 1980; December 2 and 16, 1981; and January 31 and July 21, 1983.

Westinghouse Hittman Nuclear Incorporated supplements dated: March 20, April 17, and June 13 (WHNI-E-786), 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

CEM Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 05 1984

**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
6581	17	USA/6581/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
EXXON Nuclear Company, Inc. 2101 Horn Rapids Road Richland, WA 99352	EXXON Nuclear Company, Inc. application dated May 8, 1984.

71-6581

c. DOCKET NUMBER

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 Nos.: 51032-1 and 51032-1a
- (2) Description

A steel shipping container for fuel bundles, consisting of a strongback and fuel bundle clamping assembly, shock mounted to a steel outer container. Minimum 3/8" thick wall, 6" x 8" x 8-1/2" long steel separators are bolted between fuel bundles. Outer container is approximately 43" diameter by 216" long. The maximum weight of the package is 7,400 pounds for the Model No. 51032-1 and 8,300 pounds for the Model No. 51032-1a.

(3) Drawings

The Model Nos. 51032-1 and 51032-1a are constructed in accordance with EXXON Nuclear Company, Inc. Drawing Nos.:

XN-NF-303,359, Sheet 1, Rev. 1 or 2;
XN-NF-303,360, Sheet 1, Rev. 1;
XN-NF-303,364, Sheet 1, Rev. 1; and

Package-separate block, shock mount, and fuel element clamp assembly requirements must be in accordance with Tables 2-II thru 2-IX (pp 2-14 thru 2-21) of the application; and

The Model No. 51032-1 is constructed in accordance with EXXON Nuclear Company, Inc. Drawing Nos.:

XN-NF-303,890, Sheet 1, Rev. 0; XN-NF-303,891, Sheet 1, Rev. 1 or 2;
XN-300,609, Sheet 1, Rev. 1; XN-NF-303,898, Sheet 1, Rev. 0 or 1;
XN-NF-303,897, Sheet 1, Rev. 0; and

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(a) Packaging (continued)

(3) Drawings (continued)

Jersey Nuclear Company Drawing Nos.:

JN-300,607, Sheet 1, Rev. 0 or 1;
 JN-600,843, Sheet 1, Rev. 3;
 JN-600,844, Sheet 1, Rev. 2; or

The Model No. 51032-1a is constructed in accordance with EXXON Nuclear Company, Inc. Drawing Nos.:

XN-NF-303,354, Sheet 1, Rev. 2 or 3; XN-NF-303,357, Sheet 2, Rev. 0 or 2;
 XN-NF-303,355, Sheet 1, Rev. 1; XN-NF-303,358, Sheet 1, Rev. 1 or 2;
 XN-NF-303,356, Sheet 1, Rev. 1; XN-NF-303,818, Sheet 1, Rev. 0;
 XN-NF-303,357, Sheet 1, Rev. 1 or 3.

(b) Contents

Type, form, and maximum quantity of material per package must be as follows:

(1) UO₂ fuel assemblies as follows:

Fuel Type ^a	Radioactive Material (kg/Package)	Fissile Constituents (kg/Package)	Maximum No. of Assemblies per Package
A	U-235 700	U-235 24.5	2 or 4 ^b
B	U-235 1,500	U-235 52.5	2 or 4 ^b
C	U 1,500	U-235 60.0	2 or 4 ^b
D	U 1,500	U-235 60.0	2 or 4 ^b
E	U 1,500	U-235 60.0	2 or 4 ^b
F	U 1,500	U-235 75.0	2 or 4 ^b
G	U 1,500	U-235 60.0	2 or 4 ^b
AA ^c	U 1,100	U-235 38.5	2

^aSee Tables 2-X thru 2-XII (pp 2-22 thru 2-24) of application for the limiting physical characteristics of each fuel type.

^bTwo (2) fuel elements of standard length or four (4) short elements of equivalent weight.

^cAuthorized for shipment only in Model No. 51032-1a container.

A single (1) fuel rod may be added to the above packaging in accordance with Paragraphs 2 thru 5 of Section 12.4.3.3 (pp 12-16 & 12-17) of the application.

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5. (b) Contents (continued)

- (2) Sintered uranium oxide pellets as Zr clad fuel rods packaged within the inner wooden container described by EXXON Nuclear Company, Inc. Drawing No. XN-301,901, Rev. 1. The wooden container must be limited in accordance with the individual packaging limits on U-235 enrichment, rod diameters, assembly size, and water-to-fuel volume ratios and internal moderation as those established for the generic UO₂ fuel elements.
- (3) Contents (LOFT fuel assembly) as described and limited by Appendix VIII of the application.

(c) Fissile Class

I and III

(1) Class I

Types A, B, and AA described and limited in 5(b)(1).

(2) Maximum number of packages per shipment as Class III

(1) Types C, D, E, F, and G assemblies described and limited in 5(b)(1);

Eight (8) packages

(ii) For the contents described and limited in 5(b)(2) or 5(b)(3);

One (1) package

- 6. Each fuel assembly must be enclosed in an unsealed polyethylene sheath which will not extend beyond the ends of the fuel assemblies. The ends of the sheaths must not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assemblies. Polyethylene shims and ethafoam pads may be used in the packaging of fuel assemblies in accordance with Figure 2.13 (p 2-41) and Table 12-IX (p 12-26) of the application.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: May 31, 1989.

Page 4 - Certificate No. 6581 - Revision No. 17 - Docket No. 71-6581

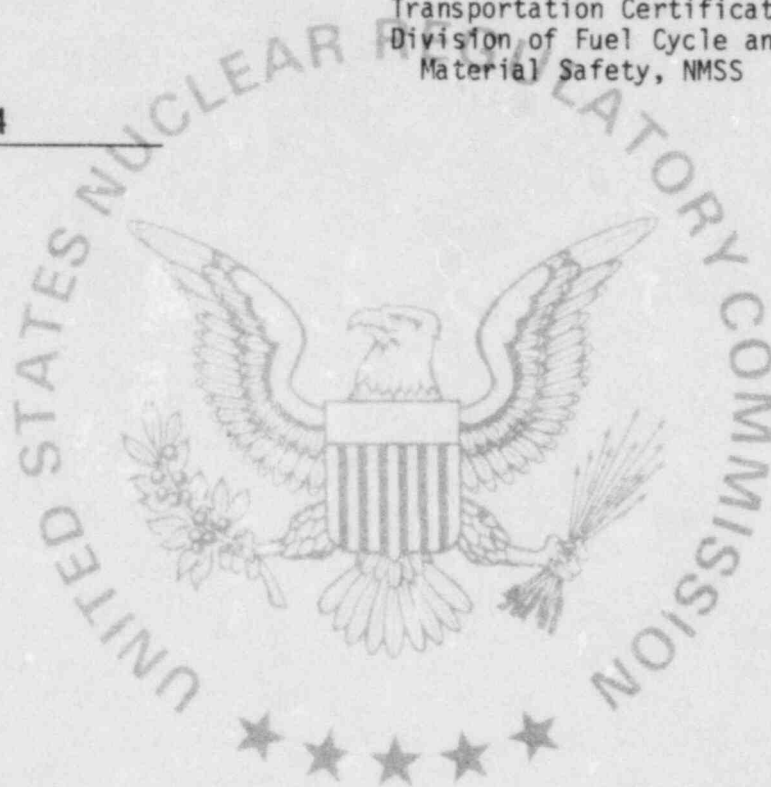
REFERENCE

EXXON Nuclear Company, Inc. application dated May 8, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: MAY 29 1984



**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
6601	19	USA/6601/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Chem-Nuclear Systems, Inc. application
dated November 19, 1979, as supplemented.

c. DOCKET NUMBER 71-6601

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.: CNS 8-120
- (2) Description

The packaging is a steel-encased, lead shielded shipping cask which weighs approximately 70,000 pounds when loaded. The cask is 73.5 inches in diameter by 92 inches high, with an effective cavity 62 inches in diameter by 75 inches long. Gamma shielding equivalent to 4.5 inches of lead is provided by lead and steel. The outer shell is fabricated of two, 3/4-inch thick steel plates and the inner shell of 1/2- and 1/4-inch thick plates. The cavity is closed and sealed by thirty-two, 1-3/4-inch bolts and a silicone O-ring within a recessed groove on the flange of the cask. A steel collar encircles the outer shell in the lid area. Shackles are used for lifting the packaging and the lid. Tie-down is accomplished through a steel structure which is not attached to the package. The lid provides several threaded and sealed access plugs and the base has a drain line.

(3) Drawings

The package is constructed in accordance with the following ATCOR, Inc. Drawing Nos.: 1042-D-0001, Rev. C; 1042-C-0002, Rev. E; 1042-B-0004, Rev. C; 1042-D-0021, Rev. C; 1042-A-0007, Rev. A; and 1042-A-0027, Rev. -.

Page 2 - Certificate No. 6601 - Revision No. 19 - Docket No. 71-6601

(b) Contents

(1) Type form of material

- (i) Byproduct material in the form of dewatered resins, solids, or solidified waste contained within secondary container(s); or
- (ii) Radioactive material in the form of activated reactor components.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material, not to exceed 2,000 times a Type A quantity, 40 thermal watts, and 20,000 pounds including weight of the contents, secondary container(s) and shoring. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

6. Except for close fitting contents, wood shoring must be placed between the secondary container(s) (or activated components) and the cask cavity to prevent movement during normal conditions of transport.
7. Prior to each shipment (except for the contents meeting the requirements for low specific activity material), the packaging must be leak tested in accordance with Section 8.2.2 of the application.
8. Prior to each shipment, a determination must be made that closure seal replacement is current with the seal replacement schedule in Section 8.2.4 of the application.
9. The packaging must be leak tested once every 12 months in accordance with Section 8.1.3 of the application.
10. The external dose rate at 3 feet from the surface of the package must not exceed 125 mrem/hr.
11. The drain line and access plugs must be appropriately plugged and sealed prior to transport. Access plugs may be modified in accordance with Chem-Nuclear Systems, Inc. letter dated December 8, 1980.
12. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
 - (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

Page 3 - Certificate No. 6601 - Revision No. 19 - Docket No. 71-6601

12. (continued)

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

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

14. Expiration date: December 31, 1985.

REFERENCES

Chem-Nuclear Systems, Inc., application dated November 19, 1979.

Supplements dated: October 7, 1982; February 8, April 14, June 29, and October 18, 1983; and January 18 and March 23, 1984.

Northeast Nuclear Energy Company supplement dated: February 9, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Obergarden

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 09 1984

**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
6613	3	USA/6613/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Tech/Ops 40 North Avenue Burlington, MA 01803	Tech/Ops application dated February 11, 1982, as supplemented. 71-6613

c. DOCKET NUMBER

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.: 702

(2) Description

The cask system overall dimensions are 19" x 21" x 20". The cask is a stainless steel weldment containing depleted uranium shielding. The cask has a central cavity which is 2.26 inches in diameter by 3.25 inches long. Closure is accomplished by a neoprene gasket, six, 3/8-inch bolts and a stainless steel stepped plug containing depleted uranium shielding. The closure is equipped with an eye bolt and two drain and vent plugs. The cask is mounted on a 19" x 21" rectangular steel skid with four, 1/2-inch bolts and a tie-down system consisting of four, 1/2-inch diameter threaded rods which connect a clamp ring at the top of the cask to channel brackets welded to the skid. A protective cage constructed of 1-1/4-inch square steel tubing and perforated 18 gauge steel sheets tack welded to the tubular frame surrounds the cask and is bolted to the skid by four, 1/2-inch bolts. Maximum gross weight of the packaging is 370 pounds.

Page 2 - Certificate No. 6613 - Revision No. 3 - Docket No. 66-6613

5. (a) Packaging (continued)

(3) Drawings

The cask and other system components are constructed in accordance with the following Technical Operations, Inc. Drawing Nos.: 70290, Sheet 1 of 4, Rev. A; 70290, Sheet 2 of 4, Rev. None; 70290, Sheet 3 of 4, Rev. None; 70290, Sheet 4 of 4, Rev. A.

(b) Contents

(1) Type and form of material

Metallic iridium 192 sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

10,000 curies.

(3) Maximum decay heat per package

100 watts.

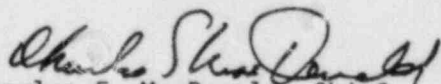
6. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: March 31, 1987.

REFERENCES

Tech/Ops application dated February 11, 1982.

Supplement dated: March 26, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: MAR 21 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 6642	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/6642/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)

**E.I. DuPont de Nemours & Company
Savannah River Plant
Aiken, SC 29801**

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

**Safety Analysis Report - Packages SRL 4.5
Ton Californium Shipping Cask, DPSPU 74-124-6,
December 1974, Rev. 1, March 1976.**

c. DOCKET NUMBER **71-6642**

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.: 4.5 Ton Cf
- (2) Description

A shielded packaging for special form materials. The outer container is a 3/4-inch thick, 61-1/2-inch OD spherical steel shell filled with borated water extended polyester (WEP) shielding. Outer shell is fitted with nine (9) fusible plugs and a vent valve for relief of gases generated in the WEP material. The cylindrical containment cavity approximately 4-inch diameter by 6-3/8 inches high is centrally located in the sphere and surrounded by lead of 2 inches, 1.9 inches and 1.75 inches thickness on the bottom, sides and top, respectively. The containment vessel is an integral part of the outer container, and is held by a 31-1/2-inch long 4-1/2-inch OD tube welded to a 3/4-inch thick 22-1/2-inch diameter top plate mounted to the outer container's closure assembly. Closure of the containment vessel is accomplished by a flange plate and sleeve insert assembly. The sleeve is a 27-inch long, 4-inch OD tube filled with lead and water extended polyester and is gasketed and bolted to the top closure assembly of the container. A 22-1/2-inch diameter protective cover bolts to the closure assembly sleeve. A hexagonal shaped assembly, approximately 5 feet across the flats mounts to the spherical shell as a base. Four lifting lugs are provided equispaced around the upper hemisphere. The cask gross weight is approximately 9,500 pounds.

Page 2 - Certificate No. 6642 - Revision No. 3 - Docket No. 71-6642

(3) Drawings

The SRL 4.5 ton Californium shipping cask is as described, and is constructed in accordance with E.R. duPont de Nemours Company Drawing Nos.: ST5-15813, Rev. 33; ST5-15814, Rev. 29; ST5-15815, Rev. 0; ST5-15816, Rev. 0; ST5-15817, Rev. 0; and ST5-15818, Rev. 5.

(b) Contents

(1) Type and form

Californium 252, as sealed source which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package.

46 curies (85 mg).

6. Prior to each shipment, the WEP shielding space shall be vented, using the 1/4-inch angle valve which is then closed.
7. Fabrication, assembly testing, use and maintenance shall be in accordance with the Quality Assurance Plan and Operating Procedures contained in Parts III and IV of DPSPU 74-124-6, Revision 1.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 871.12.
9. Expiration date: June 30, 1986.

REFERENCE

Safety Analysis Report - Packages SRL 4.5 Ton Californium Shipping Cask, DPSPU 74-124-6, December 1974, Revision 1, March 1976.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1 a. CERTIFICATE NUMBER 6677	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/6677/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): E. I. duPont de Nemours & Company Savannah River Plant Aiken, SC 29801	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: E. I. duPont Nemours & Company Report No. DPSPU-74-124-4, May 1975, Rev. 1, 4/78.
c. DOCKET NUMBER 71-6677	

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.: LP-12

Packaging for large quantities of tritium. The containment vessel is a nominal 12 liter 347 stainless steel vessel fitted with a stainless steel vacuum valve assembly. The containment vessel is 9-1/2-inch OD by 11 inches high with a 0.062-inch wall thickness. The containment vessel is secured within a closed and sealed aluminum bucket with a 10-inch OD, 20 inches high and minimum 3/16-inch thick walls. The aluminum bucket is centered and supported within an 18-gage, 19-1/4-inch OD by 30-inch high steel drum using celotex insulation. The drum is closed using a bolted locking ring. The package gross weight is 130 pounds.

(2) Drawings

The packaging is fabricated in accordance with DuPont Drawing Nos.: S5-2-731, Rev. 3; S5-2-5732, Rev. 3; S4-2-148, Rev. 16; S5-2-140, Rev. 3; and S4-2-633, Rev. 1.

Page 2 - Certificate No. 6677 - Revision No. 4 - Docket No. 71-6677

5. (b) Contents

(1) Type and form of material

Tritium gas in mixture with other gases.

(2) Maximum quantity of material per package

Not more than 12,700 cm³ of tritium at STP (1 atm, 25°C), and a maximum activity of 32,800 curies.

6. The maximum internal fill pressure in the primary containment vessel shall not exceed 16.44 psia at 25°C (77°F).

7. Acceptance, maintenance and use of the package shall be in accordance with the procedures and requirements of Chapters 6 and 7 of DuPont Report No. DPSPU-74-124-4, May 1975, Rev. 1, 4/78.

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

9. Expiration date: September 30, 1987.

REFERENCE

E.I. du Pont de Nemours and Company Report No. DPSPU-74-124-4, May 1975, Rev. 1, 4/78.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
6678	4	USA/6678/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
E.I. du Pont de Nemours & Company Savannah River Plant Aiken, SC 29801	E.I. du Pont de Nemours & Company Report No. DPSPU-74-124-5, April 1975, Rev. 1, 4/78.
	c. DOCKET NUMBER 71-6678

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.: LP-50
- (2) Description

Packaging for large quantities of tritium. The containment vessel is a nominal 50 liter 304L stainless steel vessel fitted with stainless steel vacuum valve assembly. The containment vessel is 13-5/8-inch OD by 25 inches high with 0.078 inch wall thickness. The containment vessel is held within a closed aluminum bucket with a 14 inch OD, 30 inches high and minimum 15/64-inch walls. The aluminum bucket is centered and supported within a 16-gage, 23-1/2-inch OD by 40-inch steel drum using Celotex insulation. The drum is closed using a bolted locking ring. The package gross weight is 260 pounds.

(3) Drawings

The packaging is fabricated in accordance with DuPont Drawing Nos.: S5-2-5733, Rev. 16; S5-2-5734, Rev. 9; S5-2-5735, Rev. 1; S4-2-596, Rev. 0; S5-2-186, Rev. 58; S5-2-187, Rev. 22; S4-2-633, Rev. 1; and Figure 4 of DuPont Report No. DPSPU-74-124-5, April 1975, Rev. 1, 4/78.

Page 2 - Certificate No. 6678 - Revision No. 4 - Docket No. 71-6678

5. (b) Contents

(1) Type and form of material

Tritium in mixture with other gases.

(2) Maximum quantity of material per package

Not more than 75,300 cm³ of tritium at STP (1 atm, 25°C), and a maximum activity of 193,500 Curies.

6. The maximum internal fill pressure in the primary containment vessel shall not exceed 23.2 psia at 25°C (77°F).

7. Acceptance, maintenance and use of the package shall be in accordance with the procedures and requirements of Chapters 6 and 7 of DuPont Report No. DPSPU-74-124-5, April 1975, Rev. 1, 4/78.

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

9. Expiration date: September 30, 1987.

REFERENCE

E. I. DuPont de Nemours and Company Report No. DPSPU-74-124-5, April 1975, Rev. 1, 4/78.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
6679	7	USA/6679/B()F	1	6

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Ecology, Inc.
P.O. Box 7246
Louisville, KY 40207

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Engineering Company, Inc. application
dated November 17, 1980, as supplemented.

c. DOCKET NUMBER 71-6679

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.: 6679
- (2) Description

A protective overpack which provides impact and thermal protection for its contents. The inner shell (cavity) is approximately 76" x 76" x 85" constructed of 3/16"-thick and 10-gage mild steel. Closure of the cavity is by 1/4"-thick aluminum plate with silicone rubber gasket which is bolted with 36, 1/2"-13UNC x 1-1/4" long hex head bolts and nuts to the main inner shell. The cavity is centered and supported in an outer 3/16" thick steel jacket by approximately 17" of polyurethane foam insulation at the end and 10" on the sides. A removable section or cap consisting of approximately 18" of polyurethane foam insulation encased in steel with a silicone rubber gasket is bolted with 12, 1"-8UNC x 1-1/2" long hex head bolts and nuts to the main outer steel jacket. The overall dimensions of the packages are approximately 96" x 96" x 120". Vent holes are provided on the sides and ends of the container. Set into each corner of the outer container are standard I.S.O. steel castings. The maximum total weight including weight of the contents is 24,000 pounds.

(3) Drawings

Packaging is constructed in accordance with Protective Packaging, Inc., Drawing Nos.: 32276, Sheets 1 & 2, Rev. A; 32277, Rev. B; 32278, Rev. -; and 32279, Rev. B.

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(b) Contents

- (1) Large, decontaminated equipment waste of such size as not to fit into a 55-gallon drum (with legs or other readily removable appendages removed). Not to exceed 200 grams plutonium within the package.

Equipment waste surfaces containing more than 0.5 Ci must be decontaminated to a smearable level of no more than 150,000 dpm/100 cm² prior to fixation or until successive decontamination cleaning operations do not reduce the smearable contamination levels by more than ten percent. After fixation, equipment waste surfaces must have a smearable level of contamination of no greater than 10,000 dpm/100 cm². Outer surfaces must have a smearable level of contamination of no greater than 20 dpm/100 cm². Prior to fixing of contamination, large equipment waste must be inspected to insure that: (a) all sharp or protruding objects have been removed, blunted or protected with packaging material, and (b) pipe caps, gasketed blind flanges, covers, etc., have been installed wherever possible. Following such inspection, the inner surfaces containing more than 0.5 Ci must be fixed with "strip" or "clear" coating. The inner surface(s) may alternatively be fixed with a polyurethane foam.

The large equipment waste must be enclosed in a tight-fitting box constructed of 1-inch thick plywood; or a tight fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). The space between the equipment and the box must be filled with foam (1" minimum foam thickness) and between equipment (1/2" minimum foam thickness).

Alternatively, gloveboxes contaminated and fixed as described above may be broken down as follows:

Glovebox windows are removed and separately packaged in 12-mil thick PVC bags and sealed. The inner bag is tape sealed and the outer bag is heat sealed.

Glovebox panels are cut to dimensions to fit inside the 3/16" thick corrugated steel burial crates constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). All sharp or protruding objects are removed, blunted, or protected with packaging material. The glovebox panels are bundled such that internal box surfaces are facing inward. Cut glovebox panels from not more than one glovebox are banded with metal strap banding such that two metal strap bands in each direction are placed around the length and width of the glovebox sections. The glovebox window and cut panel packages are enclosed and foamed in place within the box.

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Blocking or dunnage is placed within the box to ensure a one inch foam barrier on the sides and bottom of the box. Likewise, dunnage is provided between the banded glovebox sections to maintain a 1/2" thick foam barrier between banded packages.

- (2) Decontaminated hard waste items, such as equipment, metal cans, tools, etc., must be double bagged within 12-mil thick PVC with each bag heat sealed. The total fissile quantity of all the sealed packages in one container must not exceed 200 grams.

Hard waste surfaces must be decontaminated to a smearable level of no more than 150,000 dpm/100 cm² prior to fixation or until successive decontamination cleaning operations do not reduce the smearable contamination levels by more than 10 percent. After fixation, hard waste surfaces must have a smearable level of contamination of no greater than 10,000 dpm/100 cm². Prior to fixing of contamination, hard waste must be inspected to insure that sharp or protruding objects have been removed, blunted, or protected with packaging material. Following such inspection, the outer surfaces must be fixed with "strip" or "clear" coating. Hard waste items such as furnace shells, muffles, or other items with large cavities not accessible for decontamination must be filled with foam within the cavities. Surfaces that are not easily accessible, e.g., interiors of small diameter tubing and piping which were in contact with process materials, must have been swabbed or immersed in cleaning solution to insure removal of residual material. Open ends of the tubing and piping must be sealed using mechanical fittings.

Alternately, large heavy walled process glassware must be painted inside and outside to fix contamination and double bagged in 12-mil thick PVC with each bag heat sealed. The glassware must be secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-4, Rev. 0. The box must be filled with foam and total activity limited to less than two (2) Ci in a box.

Alternately, stainless steel transfer tubes and HEPA filters must be double bagged in 12-mil thick PVC with each bag heat sealed. The tubes/filters must be secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-28, Rev. 0. The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

Alternately, round steel ducting must be capped and secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-29, Rev. 0; 272E81-30, Rev. 0; or 272E81-31, Rev. 0. Outer surfaces of ducting will have a smearable level of contamination no greater than 20 dpm/100 cm². The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

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Sealed packages and boxes of hard waste must be enclosed in a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91838, Sheet 1, Rev. 0 (modified or unmodified). The space between the packages and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between the sealed packages must be filled with foam (1/2" minimum foam thickness).

- (3) Glove box absolute (HEPA) filters must be double bagged within 12-mil thick PVC, with each bag heat sealed and packaged within DOT Specification 17H or 17C steel drums (maximum size of 55 gallons). Each drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

Sealed drums must be a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

- (4) Soft waste items such as sheeting, gloves, paper, prefilter media, polyethylene bottles, shoe covers, etc., must be double bagged in 12-mil thick PVC, with each bag heat sealed (bag size must not exceed 22" x 16" x 10") and packaged within DOT Specification 17H or 17C steel drums (maximum size of 55 gallons). Each drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

Sealed drums must be enclosed in a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

- (5) Liquid waste (decontamination solutions only) must be solidified in concrete in a 30-gallon drum which must be sealed in a plastic bag and centered and supported in a DOT Specification 17H or 17C 55-gallon steel drum by absorbent material. The 55-gallon drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

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Alternatively, liquid waste is solidified in concrete in maximum size one (1) gallon packages which are double bagged and heat sealed in 12-mil thick PVC and placed within a DOT Specification 17H or 17C steel drum (maximum size of 55 gallons). The drum is lined with a sealed plastic liner and equipped with a standard drum closure. Each 55-gallon drum must not exceed a fissile quantity of 60 grams. For drums smaller than 55-gallons, the total fissile quantity of all the sealed packages (drums) in one container must not exceed 200 grams.

Sealed drums must be enclosed in a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91883, Sheet 1, Rev. 0 (modified or unmodified). The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

(c) Fissile Class	III
Maximum number of packages per shipment	One (1)

6. The polyurethane foam must be Instapak 200 or equivalent.
7. The maximum weight of the contents including secondary packaging, dunnage, shoring and bracing must not exceed 16,000 pounds.
8. Sufficient dunnage, shoring and/or bracing must be utilized to minimize secondary impact of the secondary packaging within the cavity under accident conditions.
9. Protrusions from secondary packaging such as lifting eyes, etc., must be positioned such that they will not contact the cavity walls, or shoring must be provided to prevent puncture of the cavity walls by the protrusions under the accident conditions.
10. Contents must be positioned in the cavity such that the center of gravity of the loaded package is substantially the same as the center of gravity of an empty package.
11. The cavity of the overpack must be vented through an absolute filter to equalize pressure between the outside and inside of the overpack.
12. Package Model No. 6679 is exempt from the requirements of 10 CFR §71.63 only for the purpose of making these shipments.

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13. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
14. Expiration date: February 28, 1989.

REFERENCES

Nuclear Engineering Company, Inc. application dated November 17, 1980.

U.S. Ecology, Inc. supplements dated: May 19 and December 23, 1982; and April 18, June 30, and October 28, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: FEB 07 1984

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER 6697	b. REVISION NUMBER 7	c. PACKAGE IDENTIFICATION NUMBER USA/6697/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): General Electric Company P.O. Box 460 Pleasanton, CA 94566	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: General Electric Company application dated November 29, 1979.	c. DOCKET NUMBER 71-6697
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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.: GE-8500
- (2) Description

The packaging is a steel, uranium shielded shipping cask surrounded by a laminated plywood protective jacket.

The inner shielded cask is an upright circular cylinder, consisting of an inner shell, 2-7/8 inches ID x 6-1/8 inches high, made of 1/8-inch thick stainless steel which is surrounded by 1-13/16 inches of depleted uranium and enclosed in a 7-inch OD x 10-1/2-inch high x 1/8-inch thick stainless steel outer shell.

Closure is by means of six, 3/8-inch diameter bolts and a 1/8-inch thick Neoprene rubber gasket between body and lid. The shielded cask is positioned in a two-piece protective jacket of solid plywood laminations which is bolted to a rectangular pallet made of aluminum. The protective jacket is 15-1/4 inches OD x 20-1/2 inches high and together with the pallet, weighs 80 pounds. The cavity of the shielded cask contains a leak tight, 2R type, steel insert, shown on GE Drawing No. 161F443, Rev. 5 or 135C5982, Rev. 4, or 106D3830, Rev. 8 (the latter to be used with the liner shown on 153C4613, Rev. 1). The gross weight of the loaded package is approximately 285 pounds.

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5. (a) Packaging (continued)

(3) Drawings

The package is constructed in accordance with the following General Electric Company Drawing Nos.: 277E696, Rev. 6; 277E712, Rev. 6; 174F482, Rev. 5; 289E795, Rev. 3; 195F169, Rev. 2; 289E796, Rev. 5; 161F443, Rev. 5; or 135C5982, Rev. 4; or 105D3830, Rev. 8 with 153C4613, Rev. 1.

(b) Contents

(1) Type and form of material

Radioactive materials in solid or liquid form.

(2) Maximum quantity of material per package

Greater than Type A quantity of solid radioactive material with the decay heat load not exceeding 50 watts. Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements.

Liquid radioactive material is limited to 100 ci of Mo-Tc solution.

6. Liquids shall be further packaged in a leak tight polyethylene bottle within the 2R insert. Each polyethylene bottle shall be sealed and tested in accordance with Attachment D of General Electric's letter dated November 29, 1979.
7. Prior to each shipment, the package lid Neoprene gasket shall be inspected. The gasket shall be replaced with a new Neoprene gasket if inspection shows any defects or every twelve (12) months, whichever occurs first. In each shipment, a new Viton O-ring shall be used to seal the 2R type insert.
8. The 2R type insert shall be pretested to ensure leak tightness prior to each use in accordance with Attachment D of General Electric's letter dated November 29, 1979.
9. The radiation dose level shall not exceed 1,000 millirem per hour, at a distance of 3 feet from the surface of the depleted uranium cask, when the wooden protective jacket is not in place.
10. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
11. Expiration date: February 28, 1985.

Page 3 - Certificate No. 6697 - Revision No. 7 - Docket No. 71-6697

REFERENCE

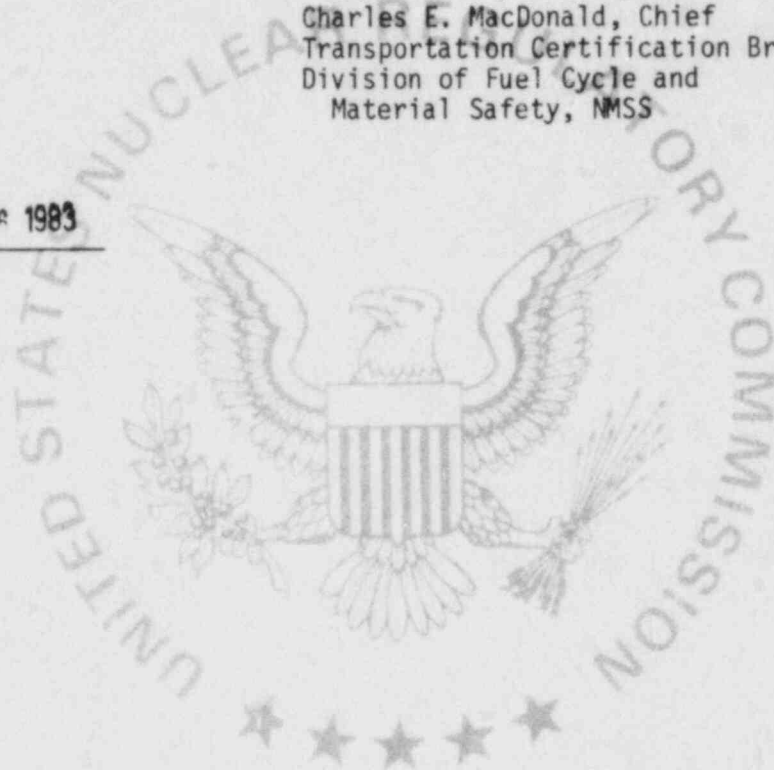
General Electric Company application dated November 29, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
6703	4	USA/6703/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

GA Technologies, Inc.
P.O. Box 81608
San Diego, CA 92138

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Atomic Company application dated
December 16, 1975.

c. DOCKET NUMBER

71-6703

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.: RG-1

(2) Description

The package, a thermoelectric generator, is 18 inches high and has a base diameter of 14 inches. The components include the main housing, uranium and tungsten shield, housing flange, electrical connector and lifting lugs. A notch at the base provides the tie-down flange. The 1.75-inch thick cover flange is bolted to the housing by 16 or 20 steel bolts depending on the generator configuration. The electrical receptacle is bolted to the cover flange with an O-ring being provided between the interfaces and on the lateral surface of the feed plug. The lifting lug is threaded into the cover flange and is removable if necessary for an operational installation. Package weight is approximately 800 pounds.

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5. (a) Packaging (continued)

(3) Drawing:

The packaging 16-bolt configuration is constructed in accordance with the detailed drawings listed on Gulf General Atomics Generator Assembly Drawing No. 1699-0001, and modified for the 20-bolt configuration by Drawing Nos.: J346-3000, Rev. K; D346-3020, Rev. F; and D346-3021, Rev. G.

(b) Contents

(1) Type and form of material

Strontium 90 titanate doubly encapsulated in a Type 304L stainless steel liner and Hastelloy C capsule.

(2) Maximum quantity of material per package

8,300 curies.

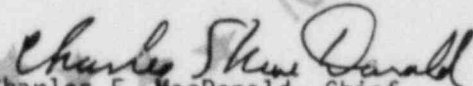
6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

7. Expiration date: February 28, 1985.

REFERENCE

General Atomic Company application dated December 16, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 05 1983

Date: _____

**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
6717	5	USA/6717-B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Gamma Industries
P.O. Box 2543
Baton Rouge, LA 70821

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, inc. application dated
June 20, 1975, as supplemented

c. DOCKET NUMBER 71-6717

4. CONDITIONS

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

5. (a) Packaging

- (1) Model No.: 6717-B
- (2) Description

Radiographic device within a protective overpack. The overpack consists of an outer container which is a 10-gallon open head steel drum having a minimum 20-gauge body and cover, welded seams and a clamp-ring type head closure. The void space between the inner and outer container is filled with 1-1/2" thick molded asbestos free liner on sides, top and bottom, plus molded polyurethane filler to position and secure the radiographic device within the drum. Maximum gross weight of the package not to exceed 75 pounds.

(3) Drawing

The packaging is constructed in accordance with Nuclear Packaging Inc. Drawing No. SK-D-1, Rev. 2.

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5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

200 curies.

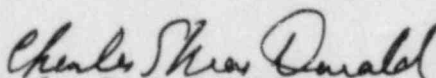
6. The contents must be secured in a single snug-fitting inner radiographic device which has a metal outer wall and meets the requirements of DOT Specification 7A packaging.
7. The source shall be secured in the shielded position of the radiographic device by the shipping plug, source assembly, and locking device. The shipping plug and source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.12.
9. Expiration date: July 31, 1985.

REFERENCES

Nuclear Packaging, Inc. application dated June 20, 1975.

Supplements dated: August 8, 1975; and February 26, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
6722	7	USA/6722/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Tennessee Valley Authority
400 Chestnut Street, Tower II
Chattanooga, TN 37401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Tennessee Valley Authority application dated
July 9, 1975, as supplemented.

71-6722

c. DOCKET NUMBER

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.: BS-33-180

(2) Description

The shipping cask is a cylindrical steel weldment with overall dimensions of 84 inches in diameter and 97-1/4 inches in length. The effective cavity is 76-1/2 inches in diameter by 79-1/4 inches long. The outer shell is fabricated of concentric layers consisting of three, one-inch thick and 1/2-inch thick carbon steel plates. The inner half-inch thick shell is separated from the one-inch thick shells by a 1/4-inch thick asbestos sheet. The flange is three inches thick, with 36 tapped holes and a groove to accommodate a silicone O-ring. The top cover is secured to the flange ring by 36, ASTM-A-320, Grade L7 1-1/2-inch bolts. A 10-inch deep steel impact limiter is mounted to the top cover to act as a shock absorber. The cask is mounted to a tie-down frame by sixteen, 1-1/4-inch high strength steel bolts. Other cask features include a drain line, access port to the inner container(s) and a reinforcing steel shell to protect the cask seal. Threaded access plugs are installed on the top of the liner. A bottom side drain is also provided. Maximum gross weight is approximately 51,100 pounds.

(3) Drawings

The packaging is constructed in accordance with the following ATCOR Inc. Drawing Nos.: 0568-C-0024, Rev. E; 0568-D-0022, Rev. E; 0568-D-0023, Rev. D; 0568-C-0026, Rev. B; 0568-A-0013, Rev. B; and 0568-D-0002, Rev. K.

Page 2 - Certificate No. 6722 - Revision No. 7 - Docket No. 71-6722

5. (b) Contents

(1) Type and form of material

Solids or solidified waste, meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents (including containers and shoring) limited to 18,000 pounds and 20 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Dunnage must be provided in the shipping cask cavity sufficient to prevent significant movement of the inner container(s) relative to the outer packaging under normal conditions of transport.

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- 8. Operating procedures must assure that:
 - (i) All threaded pipe plugs in the cask are sealed using an appropriate sealant.
 - (ii) The space between the inner container(s) and cask cavity must be dry prior to delivery to a carrier for transport.
- 9. Prior to each shipment, the package lid seal must be inspected. The seal must be replaced with a new silicone O-ring if inspection shows any defects or every twelve (12) months, whichever occurs first.
- 10. All eight (8) lifting shackles must be shrouded by the appropriate covers prior to transport to prevent its use as tie-down devices.
- 11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
- 12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 13. Expiration date: November 30, 1985.

REFERENCES

Tennessee Valley Authority application dated July 9, 1975.
 Supplement dated: February 10, 1977.
 ATCOR supplements dated: October 29 and November 5, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 6744	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/6744/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Teledyne Energy Systems 110 West Timonium Road Timonium, MD 21093	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Protective Packaging, Inc. application dated March 25, 1975, as supplemented. 71-6744
c. DOCKET NUMBER	

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.: 6744

(2) Description

The packaging consists of an overpack which provides thermal and impact resistance for an inner shielded cask. Each packaging consists of an outer overpack of two concentric right circular steel cylinders with the annulus filled with 5 to 9 inches of polyurethane foam (U-2333) on the sides and 10.5 to 19 inches at the ends. The overpacks are split in the middle and joined by flanged closures to completely enclose the lead shielded inner cask. The inner cask consists of right circular cylinder with steel-encased lead shielding and bolted, Neoprene gasketed closure. Three (3) overpacks and eight (8) shielded casks comprise the authorized packaging. Dimensions and maximum weights of the three overpacks are as follows:

<u>Overpack</u>	<u>Dimensions</u>	<u>Gross Weight (lbs)</u>
32340-1	79.5" dia. x 105.7" high	35,000
32340-2	77.7" dia. x 100.4" high	35,000
32341	38.5" dia. x 76.5" high	6,500

(3) Drawings

The overpacks and shielded casks are constructed in accordance with the following Protective Packaging, Inc. Drawing Nos.:

<u>Package</u>	<u>Overpack</u>	<u>Shielded Cask</u>
1	32340-1, Rev. B	32216-3, Rev. D
2	32340-1, Rev. B	32216-4, Rev. D
3	32340-2, Rev. B	32216-1, Rev. D
4	32340-2, Rev. B	32216-2, Rev. D
5	32340-2, Rev. B	32133, Rev. B
6	32341, Rev. B	32151, Rev. A
7	32340-1, Rev. D	109-55D0025, Rev. B
8	32340-2, Rev. D	109-55D0024, Rev. B

Page 2 - Certificate No. 6744 - Revision No. 6 - Docket No. 71-6744

5. (b) Contents

(1) Type and form of material

Radioactive material, as solids, in normal or special form within lead shielded casks which are enclosed in an appropriate overpack.

(2) Maximum quantity of material per package

Thermal decay heat not to exceed 10 watts for solids that will not decompose at temperatures up to 300°F and 5 watts for other solids. Fissile material content not to exceed the generally licensed mass limits and Fissile Class specified in 10 CFR §§71.18, 71.20, and 71.22.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

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

8. Expiration date: November 30, 1985.

Page 3 - Certificate No. 6744 - Revision No. 6 - Docket No. 71-6744

REFERENCES

Protective Packaging, Inc. application dated March 25, 1975.

Supplements dated: July 21, 1975; and July 2 and November 11, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

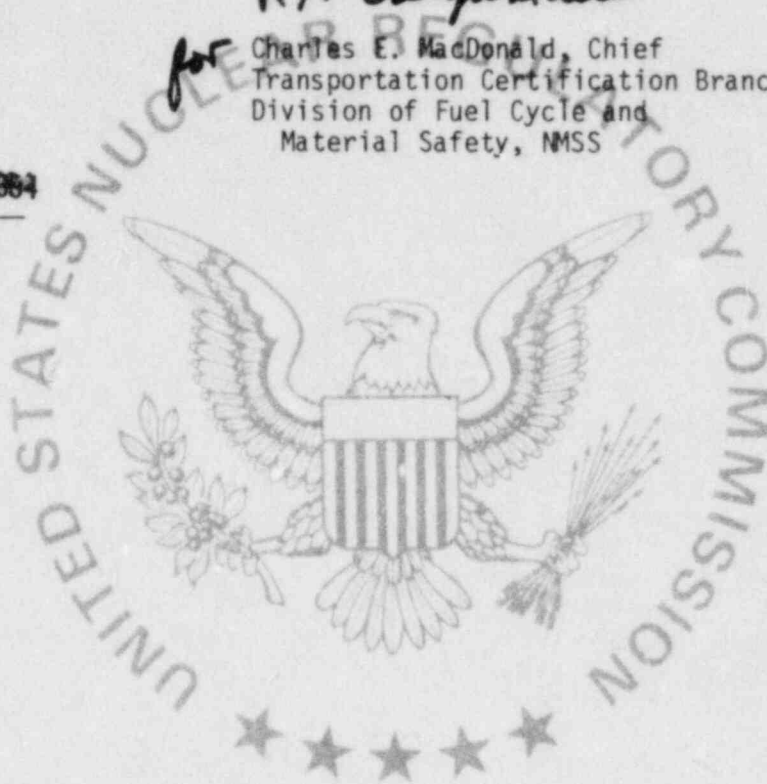
RH Odegarden

for

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date:

JUL 05 1984



**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
6745	4	USA/6745/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

GA Technologies, Inc.
P.O. Box 81608
San Diego, CA 92138

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Atomic Company application dated
December 16, 1975.

c. DOCKET NUMBER

71-6745

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.: FSV-2

(2) Description

The package consists of a right circular cylindrical containment vessel enclosed in a removable plywood overpack. The containment vessel is carbon steel 67-3/4 inches long by 44 inches OD with minimum 3-3/4-inch thick walls and ends. The closure is gasketed (asbestos) and secured by twelve, 3/4"-10 UNC bolts. Contents are enclosed within an additional gasketed steel inner vessel which is positioned within the containment vessel by crushable spacers located at the top and bottom. The laminated plywood overpack is 94 inches long by 70 inches in diameter and provides a minimum 8-inch thick cover around the containment vessel. The overpack is secured through the base by sixteen, 3/4-inch diameter bolts. The total weight of the loaded package is 18,200 pounds.

(3) Drawing

The packaging is constructed in accordance with GGA Drawing No. T1601-452, Issue H.

Page 2 - Certificate No. 6745 - Revision No. 4 - Docket No. 71-6745

5. (b) Contents

(1) Type and form of material

Contaminated metal equipment.

(2) Maximum quantity of material per package

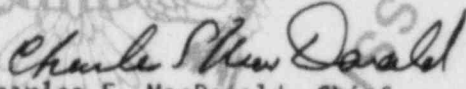
Not to exceed 5 watts.

6. Prior to each shipment, the asbestos lid gasket shall be inspected. The gasket shall be replaced with a new gasket if inspection shows any defects or every twelve (12) months, whichever occurs first.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: February 28, 1985.

REFERENCE

General Atomic Company application dated December 16, 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

SEP 06 1983

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
6771	7	USA/6771/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

GPU Nuclear Corporation
P.O. Box 480
Middletown, PA 17057

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Metropolitan Edison Company application
dated April 27, 1981, as supplemented

c. DOCKET NUMBER

71-6771

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.: SN-1
- (2) Description

A shipping container for radioactive waste. The packaging consists of an outer container which is a 4-inch thick right circular cylindrical steel shell. The cylinder is 80 inches in diameter and 84 inches high with a welded bottom plate and a cover secured by 24, 1-1/4-inch diameter steel bolts with a silicone rubber O-ring. Impact limiters consisting of shock absorbing foam clad in 24-gauge stainless steel are provided at the top and bottom of the container. The remainder of the cask is surrounded by a one-inch layer of canned insulation. The maximum weight, including contents, is 60,000 pounds.

(3) Drawings

The packaging is constructed in accordance with SUNTAC Nuclear Corporation Drawing No. B-08001, Revision E; Wilson Manufacturing Company, Inc., Drawing No. 73-8333-B, Rev. A; and Rilco Manufacturing Company, Inc., Drawing No. 72-A-124, Rev. 0.

(b) Contents

- (1) Type and form of material
 - (i) Greater than Type A quantity of radioactive material of nonfissile classification as process solids, either dewatered, solid or solidified, in leak tight secondary containers; or
 - (ii) Greater than Type A quantity of radioactive material of nonfissile classification as contaminated or irradiated solid material, such as spent reactor internals, in leak tight secondary containers.
- (2) Maximum quantity of material per package.

5,000 curies

Page 2 - Certificate No. 6771 - Revision No. 7 - Docket No. 71-6771

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. As required, shoring must be placed between the contents of Item 5(b)(1)(ii) and secondary container and the secondary container(s) and the cask cavity to limit movement during accident conditions of transport.
8. Prior to each shipment, the packaging lid silicone rubber O-ring must be inspected. The O-ring must be replaced with a new silicone O-ring if inspection shows any defects or every six (6) months, whichever occurs first.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: July 31, 1986.

REFERENCES

Metropolitan Edison Company application dated April 27, 1981.

GPU Nuclear Corporation supplement dated: December 20, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Alexander

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 0 5 1984

**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
6786	3	USA/6786/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Department of the Navy
Naval Support Force Antarctica
FPO San Francisco, CA 96601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Aerojet application dated February 18, 1971,
as supplemented.

c. DOCKET NUMBER

71-6786

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 Nos.: URIPS-8A and URIPS-8B

(2) Description

The packages, thermoelectric generators, are 28.5 inches in overall height, with an outer diameter of 19.14 inches, and total weight of approx. 1,600 pounds. The components include a depleted uranium shield (470 lbs.), a steel housing, cover bolts (recessed and caulked over), an electrical adaptor, cooling fin system, and cylindrical fin guard, stiffened by eight ribs on the inside surface. The housings are equipped with lifting and tie down devices. The Model No. URIPS-8B differs from Model No. URIPS-8A in the electric converter system. The thermoelectric generator may be secured in a shipping frame identified in Drawing No. 1138459.

(3) Drawings

The package is constructed in accordance with the following Aerojet Company Drawing Nos.:

1138441
1138442
1138457

8-Watt URIPS-8A Assembly
Generator Housing
Cooling Fins

Page 2 - Certificate No. 6786 - Revision No. 3 - Docket No. 71-6786

5. (a) Packaging (continued)

1139240, Rev. A	Fin Guard
1138245, Rev. A	Shipping Package URIPS-8
1139246	8-Watt URIPS-8B Assembly
1138459, Rev. A	Shipping Frame-URIPS-8
1138443, Rev. B	Top Cover
1138444	Bottom Cover
1138437	Shield Uranium
1138436	Fuel Capsule
1138435	Fuel Liner
1138440	W-2 Shield Plug
1138453	Insulation
1138455	Copper Plug

(b) Contents

(1) Type and form of material

Strontium 90 titanate doubly encapsulated which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

56,850 ci.

6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: July 31, 1985.

REFERENCES

Aerojet Nuclear Systems Company application dated February 18, 1971.

Supplemented by Naval Nuclear Power Unit letter dated: December 10, 1971, and Oak Ridge National Laboratory dated: December 28, 1972; and February 27 and March 27, 1973.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9001	20	USA/9001/B()F	1	6

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Uranium
Management Corporation
P.O. Box 508
Sunnyvale, CA 94086

General Electric Company application dated
October 8, 1979, as supplemented.

c. DOCKET NUMBER 71-9001

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.: IF-300
- (2) Description

A stainless steel encased, depleted uranium shielded cask. The cask is cylindrical in shape, 64 inches in diameter and a maximum of 210 inches long with maximum cavity dimensions of 37-1/2 inches in diameter by 180-1/4 inches long. Shielding is provided by 4 inches of depleted uranium, 2-1/8 inches of stainless steel and a minimum of 4-1/2 inches of water.

Two closure heads are provided for the shipment of BWR and PWR fuel assemblies. The heads are 304 stainless steel forgings and end plates which encase the 3-inch thick depleted uranium shielding. Either closure head may be used for packaging solid irradiated hardware.

The closure heads are secured to the cask body by means of 32, 1-3/4 inch studs and nuts. The cask is sealed with a metallic ring gasket.

The cavity is penetrated by a vent line at the top and a drain line at the bottom. These lines are sealed by bellows seal stainless steel globe valves and valved quick-disconnect couplings. The vent line is also equipped with a 375 psig relief valve or a 350-400 psig rated rupture disk. All valves are housed in protected boxes on the cask exterior.

Page 2 - Certificate No. 9001 - Revision No. 20 - Docket No. 71-9001

5. (a) Packaging (continued)

(2) Description (continued)

Neutron shielding is provided by a liquid-filled, thin-walled, corrugated containment on the cask exterior. This cylindrical structure is separated into two longitudinal compartments, each equipped with two expansion tanks, fill and relief valves. The fill line from each compartment is terminated by a stainless steel globe valve in a protected box (separate from cavity boxes) on the cask exterior. The vent line from each compartment goes to an expansion tank which is provided with a pressure relief valve set at 200 psig.

The cask has two types of fuel baskets which can be interchanged to accommodate various fuels. The PWR basket holds 7 assemblies, the BWR basket holds 18 assemblies. The BWR fuel basket may be provided with supplementary shielding (depleted uranium) near the cask closure.

The cask is shipped horizontally with the bottom supported in a tipping cradle between two pedestals and the upper end resting in a semi-circular saddle; the upper end is pinned to the saddle. The cask supports are welded to the framing of a 37-1/2-foot long by 8-foot wide structural steel skid. The skid may also have installed on it an auxiliary cooling system, consisting of two diesel engines driving two blowers which discharge cooling air to the corrugated surface of the cask via common ducting. Neither installation nor operation of all or part of this auxiliary cooling system is a requirement of this package approval.

The entire cask and cooling system is covered by a retractable aluminum enclosure. Access to the enclosure is via locked panels in the side and a locked door in one end. Although the Model No. IF-300 cask can be transported for short distances on the highway, its principal mode of transportation is by railroad.

The gross weight of the cask is approximately 140,000 pounds. The skid and other external components weigh approximately 35,000 pounds.

(3) Drawing

The Model No. IF-300 shipping cask is described by the following General Electric Company Drawing No.: 159C5238 - Sheets 1 thru 2, Rev. 3; Sheet 3, Rev. 5; Sheet 4, Rev. 6; Sheet 5, Rev. 5; Sheet 6, Rev. 5; Sheet 7, Rev. 4; Sheet 8, Rev. 5; Sheet 9, Rev. 4; Sheet 10, Rev. 5; and Sheet 11, Rev. 2.

Page 3 - Certificate No. 9001 - Revision No. 20 - Docket No. 71-9001

5. (a) (4) Basic Components

The Basic Components of the Model No. IF-300 shipping cask that are important to nuclear safety are listed in Subsection 10.5.

(b) Contents

(1) Type and form of material

(i) Irradiated PWR and BWR uranium oxide fuel assemblies. PWR assemblies may be shipped with or without control rods. Partial fuel assemblies, that is, assemblies from which fuel pins are missing, must not be shipped unless dummy fuel pins are used to displace an amount of water equal to that displaced by the original pins. The specific power of each fuel assembly must not exceed 40 kw/kgU and the burnup of each fuel assembly must not exceed 35,000 MWD/MTU. The minimum cooling time of each assembly must be no less than 120 days. Prior to irradiation, the BWR and PWR fuel assemblies must have the following dimensions and specifications:

Group I fuel assemblies

	<u>PWR</u>	<u>BWR</u>
Fuel form	Clad UO ₂ pellets	Clad UO ₂ pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	465	198
Maximum initial U-235 enrichment, w/o	4.0	4.0
Maximum bundle cross section, in	8.75	5.75
Fuel pin array	14x14/15x15	7x7
Fuel diameter, in	0.380-0.460	0.500-0.600
Fuel pin pitch range, in	0.502-0.582	0.647-0.809
Maximum active fuel length, in	145	146

5. (b) Contents (continued)

Group II fuel assemblies

	<u>PWR</u>	<u>BWR</u>
Fuel form	Clad UO ₂ pellets	Clad UO ₂ pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	475	198
Maximum initial U-235 enrichment, w/o	4.0	4.0
Maximum bundle cross section, in	8.75	8.75
Fuel pin array	16x16/17x17	8x8
Fuel diameter, in	0.376-0.400	0.475-0.505
Fuel pin pitch range, in	0.496-0.507	0.630-0.645
Maximum active fuel length, in	150	150

(i) Solid non-fissile irradiated hardware. As needed, appropriate component spacers must be used when loading irradiated hardware into the cask cavity to limit movement of the contents during accident conditions of transport. Use of a steel liner is authorized provided: (1) its outside dimensions are approximately those of the cask cavity inside dimensions, (2) constructed of single thickness of steel plate with full penetration welds, (3) thickness of steel plate does not exceed one inch, and (4) the liner is provided with a drain and vent to insure water removal.

(2) Maximum quantity of material per package

(i) Maximum decay heat per package not to exceed 40,000 Btu/hr. Maximum 5,725 Btu/hr/PWR assembly. Maximum 2,225 Btu/hr/BWR assembly.

(ii) Seven (7) PWR fuel assemblies, or eighteen (18) BWR fuel assemblies.

(iii) Above fuel assemblies to be contained in their respective fuel baskets as shown in GE Drawing No. 159C5238 - Sheet 6, Rev. 5.

(c) Unloaded package - contents and maximum quantity of material

Greater than a Type A quantity of residual radioactive material consisting of mixed-fission and activation products adhering to interior cavity and fuel basket surfaces.

(d) Fissile Class

I

Page 5 - Certificate No. 9001 - Revision No. 20 - Docket No. 71-9001

6. The end of life total calculated residual gas that could become available from the fuel pins must not exceed 0.23 lb moles for content 5(b) and individual calculated fuel pin pressure must not exceed 2,500 psia, at 900°F.
7. The maximum gross weight of the cavity contents must not exceed 21,000 pounds.
8. For the contents described in 5(b), the cavity fill specifications must include the following: An air void must be established such that not more than 1.0 cu ft of water (corresponding to a bulk water temperature of 70°F) remains in the cavity. The licensee must take sufficient time-temperature-pressure data to ensure that the cavity pressure will not exceed 45 psig, and that the average cavity wall temperature will not exceed 210°F during the 130°F day with no auxiliary cooling.
9. For the shipment of irradiated fuel assemblies, the cask cavity (containment vessel) must be promptly inerted following removal of the water from the cavity. The cask cavity must be purged at least three (3) times with argon, nitrogen, or helium. Each purge volume must be equivalent to or greater than the cask cavity volume. After the final purge, the cavity must be promptly filled with argon, nitrogen, or helium at 1.0 atm pressure.
10. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.
11. Prior to each shipment, the licensee must confirm that the cask is properly sealed by testing as specified in Subsection 11.3.3.1.
12. The cask contents shall be so limited that under normal conditions prior to transport, 62 times the neutron dose rate plus 6.3 times the gamma dose rate will not exceed 560 mrem/hr at a distance of (6) feet from the side of the cask (10 feet from the cask center-line).
13. The neutron shielding tanks must be filled with approximately a 50/50 volume percent mixture of ethylene glycol and water during the months of October through May.
14. In addition the requirements of Subpart G of 10 CFR Part 71, each package prior to first use must meet all of the acceptance tests and criteria specified in Subsections 6.7.6.2, 11.3.1.1, and 11.3.1.7.
15. Each cavity relief valve, typical glove valves, and typical shielding tank (barrel expansion tank) relief valves must be tested as stated in Subsections 6.5.3.3, 6.6.1.1, and 6.6.1.2.

In lieu of the requirements of 10 CFR §71.87(e), valve testing and maintenance frequency must be as stated in Subsections 6.5.3.4, 6.6.2.1, and 6.6.2.2 except during periods of cask inactivity. If a rupture disk device is utilized for dry shipments, the rupture disk device must be maintained and replaced as stated in Subsection 6.5.8.2 in lieu of the requirements of 10 CFR §71.87(e). During inactive periods the maintenance and testing frequency may be disregarded provided that the package is brought into full compliance with these requirements prior to the next use of the package.

Page 6 - Certificate No. 9001 - Revision No. 20 - Docket No. 71-9001

16. The cask cavity must be equipped with either (1) a Target Rock 73J pressure relief valve set at a pressure of 375 psig (450°F). The valve is shown in Target Rock Corporation Drawing No. 73J-001, Rev. H, J, K, or L; or (2) a rupture disk device with a burst pressure within the range of 350-400 psig (443°F) including all tolerances.
17. The uranium shielding material must be separated from all steel surfaces with a minimum copper thickness of 4-mils, except that the stud bolts attaching the shield assemblies to top of the BWR basket must be coated with a minimum of 1/2-mil of copper.
18. No shutoff valve shall be installed between each neutron shield tank and its respective thermal expansion tank.
19. The package authorized by the certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
20. Expiration date: October 31, 1984.

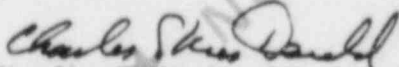
REFERENCES

General Electric Company consolidated application dated October 8, 1979.

Supplements dated: May 12, July 21, and November 26, 1980; February 6 and December 29, 1981; March 15 and September 20, 1982; March 18 and October 14, 1983; and February 24 and April 12, 1984.

Section XI, Quality Assurance and Testing, is deleted from the application.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 11 1984

**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
9006	6	USA/9006/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Automation Industries, Inc.
P.O. Box 245
Phoenixville, PA 19460

Automation Industries, Inc. application
dated July 25, 1973, as supplemented.

c. DOCKET NUMBER 71-9006

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.: 500-SU
- (2) Description

A radiographic source changer consisting of a welded 10-gauge stainless steel box, approximately 5" wide x 6" high x 11" long. The source changer has a positive closure hinged flat plate cover and a depleted uranium shield. Two titanium tubes are positioned in the center of the depleted uranium and house the source capsules and the source cable assemblies. The two openings are closed by threaded caps. The gross weight is approximately 60 pounds.

(3) Drawings

The packaging is constructed in accordance with Automation Industries, Inc. Drawing Nos. 500-SU, Rev. C; 500-SU-1; and optional SKETCH 500-SU, Rev. A.

(b) Contents

- (1) Type and form of material

Iridium 192 as a sealed source which meets the requirements of special form radioactive material.

- (2) Maximum quantity of material per package

120 curies

Page 2 - Certificate No. 9006 - Revision No. 6 - Docket No. 71-9006

6. The source shall be positioned within the titanium tubing by a source cable assembly which meets the parameters shown in Automation Industries, Inc. Drawing No. SK-500-SU; or, Tech/Ops, Inc. Drawing Nos. 42402-1, Rev. A, and SK2334-2, Rev. B.
7. The name plate shall be fabricated of material's capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: January 31, 1985.


REFERENCES

Automation Industries, Inc. application dated July 25, 1973.

Supplements dated: November 28, 1973; October 22, 1982; and May 19 and July 14, 1983.

Tech/Ops, Inc. supplement dated: June 11, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 21 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9007	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/9007/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Automation Industries, Inc. P.O. Box 245 Phoenixville, PA 19460	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Automation Industries, Inc. application dated July 25, 1973, as supplemented.
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c. DOCKET NUMBER 71-9007

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.: 520
- (2) Description

A uranium shielded radiographic device consisting of an ovated 5" OD x 1/8" thick steel pipe welded to two, 10-gauge end plates. An opening on each plate gives access to the "S"-shaped titanium tubing which houses the source capsule, source cable assembly, and the end plug. The two end openings are closed with threaded end caps. A lock mechanism is provided at the source cable attachment. Gross weight of the package is approximately 40 pounds.

(3) Drawings

The packaging is constructed in accordance with Automation Industries, Inc. Drawing Nos. 200-520-001, Rev. A; 100-520-001/012; 200-520-011; 100-520-014; and 100-520-013.

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5. (b) Contents

(1) Type and form of material

Iridium 192 as a sealed source which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

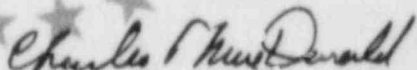
6. The source shall be positioned within the titanium tubing by a source cable assembly which meets the parameters shown in Automation Industries, Inc. Drawing No. SK-500-SU.
7. The nameplate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: December 31, 1985.

REFERENCES

Automation Industries, Inc. application dated July 25, 1973.

Supplements dated: November 28, 1973; and February 18 and April 4, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 04 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9009	b. REVISION NUMBER 11	c. PACKAGE IDENTIFICATION NUMBER USA/9009/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 780
Wilmington, NC 28402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated
January 27, 1984, as supplemented.

71-9009

c. DOCKET NUMBER

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.: FL 10-1
- (2) Description

Two, 16-gauge 55-gallon drums welded end to end, approximately 68 inches long and 22-1/2 inches in diameter. The outer drum closure shall be accomplished by at least a 12-gauge bolt-locking ring with drop-forged lugs, one of which is threaded to receive at least 5/8-inch diameter bolt and lock nut. The pressure vessel support mechanism consists of wood supports, steel inner sleeve and nut ring to receive the containment vessel, and fire resistant phenolic foam, formed in place to an average finished density of at least 8 pounds per cubic foot for the main body and 10 pounds per cubic foot for the cap. Gas relief holes shall be provided in the outer steel drum.

The containment vessel is a 304L stainless steel 5-inch Schedule 40 pipe, approximately 53-1/2 inches long, with a 304L stainless steel 1/2-inch thick welded bottom plate and a 304L stainless steel 300 pound slipon flange and blind flange which is fastened by eight, 3/4-inch steel bolts. The flange closure is gasketed by two fluoroelastomer O-rings with a pressure tap between the two O-rings grooves. During shipment, the O-ring groove pressure tap is sealed with a pipe plug with threads wrapped in teflon tape. A 1/4-inch stainless steel valve is screwed into the blind flange of the containment vessel. The valve is sealed by a pipe cap (threads wrapped with Teflon tape) and is protected by a 2-1/2-inch high section 5-inch Schedule 40 pipe welded to the top of the flange. The packaging has a maximum gross weight of 515 lbs.

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5. (a) (3) Drawings

The Model No. FL 10-1 package is constructed in accordance with General Electric Company Drawing No. 112D3018, Rev. 2.

(b) Contents

(1) Type and form of material

- (i) Uranyl nitrate solutions enriched in the U-235 isotope, provided that the U-233 and plutonium content is not more than 1% of the U-235 content; or
- (ii) Uranyl nitrate solutions having a combined concentration of uranium 233 and uranium 235 not exceeding 250 grams per liter and an H to fissile material atomic ratio not less than 80 provided (1) the U-233 content is not greater than 20% of the combined U-233 and U-235 content, and (2) the plutonium content is not more than 1% of the combined U-233 or U-235 content; or
- (iii) Plutonium nitrate solutions having a concentration not exceeding 250 grams fissile plutonium per liter; or
- (iv) Uranyl sulfate solution (UO_2SO_4) containing uranium-235; or
- (v) Dry compounds and mixtures of fissile plutonium-uranium-235; or
- (vi) Mixed U-Pu oxide interspersed with graphite or silicon carbide plus plastic packing material.

(2) Maximum quantity of material per package

Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy, or reactor elements; or must be in accordance with Item 9 below; and:

- (i) For the contents described in 5(b)(1)(i), (ii), and (iii):

Maximum decay heat load not to exceed 21 watts, and 10.5 liters of solution.

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5. (b) Contents (continued)

(ii) For the contents described in 5(b)(1)(iv):

Maximum decay heat load not to exceed 18 watts and 950 grams fissile material.

(iii) For the contents described in 5(b)(1)(v):

Maximum decay heat load not to exceed 30 watts, and 4.5 kilograms fissile material.

(iv) For the contents described in 5(b)(1)(vi):

Maximum decay heat load not to exceed 10 watts and 300 grams fissile material.

(c) Fissile Class

6. The solution contents of the package shall be contained with a bottle having one of the following specifications:

(i) Split vent polyethylene bottle per Drawing No. CAPE-1170-37,

(ii) Drop-vent polyethylene bottle per Nuclear Fuel Services, Inc., Specification U-1 and Drawing No. 5B-U-740, or per General Electric Company Drawing No. 112D3013, Rev. 0, or

(iii) Stainless steel bottle as shown on General Electric Company Drawing Nos. FRO-140 and FRO-140A.

7. The polyethylene bottles may be packaged within the metal inner container described by Chester-Jensen Company, Inc., Drawing Nos. 1092M-1, 1093M-1, 1095M-1 and 1096M-1, Issue 1, dated April 26, 1971.

8. The packaging for the polyethylene bottles shall include a flexible restraining device (such as recommended in ARH-1819 "Vibration Testing of L-3 and L-10 Shipping Containers") placed between the cap assembly of the polyethylene bottle and the closure flange of the pressure vessel to assure that the polyethylene bottle will vibrate at the same frequency as the pressure vessel during transport.

9. Dry compounds and mixtures which shall be packaged within sealed metal cans or DOT Specification 2R containers and placed within an inner container constructed and leak tested as specified on General Electric Illustration AFL 1105. Following the gas leak testing specified on the Illustration, all inner container welds shall be tested using a liquid penetrant method in accordance with Article 6, Section V, ASME Code. Alternatively, the inner container shown in the Illustration may be constructed of 300 series stainless steel pipe with an outside diameter of 4.500 ± 0.031 inches with a wall thickness ranging between 0.095 and 0.140 inch.

10. Appropriate steps shall be taken to assure that from the time of sealing to the time of delivery to the consignee, the pressure in the containment vessel will not exceed 40 psig.

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11. Prior to each shipment of more than Type A quantity of radioactive material, the space between the double O-ring seal shall be tested at 100 psig and leak detection performed by a method capable of detecting a leak greater than 10^{-3} atm cc/sec at standard temperature and pressure. No package with a detectable leak shall be delivered to a carrier for transport.
12. In addition to the requirements of Subpart G of 10 CFR 71, a test shall be performed on each containment vessel and associated 1/4-inch stainless steel valve (without its associated pipe cap) initially and once each year at 300 psig and the leak detection performed by a method capable of detecting a leak greater than 10^{-6} atm cc/sec at standard temperature and pressure. Any chamber that fails to pass the test shall be withdrawn from service and repaired to meet the test. For shipment of the contents of not more than a Type A quantity of radioactive material, this test shall not be required.
13. The fire resistant phenolic foam shall be in accordance with AEC Materials and Equipment Specification SP-9 or as modified by ORGDP Reports K/TL-729 and K/P-6567S.
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: May 31, 1989.

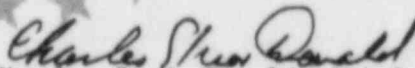
REFERENCES

General Electric Company application dated January 27, 1984.

Supplements dated: April 26 and May 16, 1984.

Westinghouse Electric Corporation supplement dated: May 15, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: MAY 31 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9010	b. REVISION NUMBER 13	c. PACKAGE IDENTIFICATION NUMBER USA/9010/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 5
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Nuclear Assurance Corporation 5720 Peachtree Parkway Norcross, GA 30092	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: NL Industries, Inc. application dated March 7, 1980, as supplemented. 71-9010
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c. DOCKET NUMBER

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.: NLI-1/2

(2) Description

A depleted uranium, water, and lead shielded shipping cask, encased in stainless steel, and equipped with balsa impact limiters. The cylindrical cask body is 195-1/4 inches long by 47-1/8 inches OD. The principal shielding consists of 2-3/4 inches of depleted uranium, 2-1/8 inches of lead, and 5 inches of (borated) water-ethylene glycol mixture.

A 7/8-inch thick stainless steel outer shell is welded to a solid stainless steel forging at each end of the cask. The outer shell of the cask is surrounded by a 1/4-inch thick steel water jacket that is also attached to the end forgings. A water expansion tank is welded to the water jacket shell. The inner cask cavity is formed by a 1/2-inch thick, stainless steel cylindrical shell; welded at its top end to the upper cask forging and at its bottom end to a circular plate.

There are two separate configurations of the cask.

Configuration (A): The containment vessel is a right circular stainless steel shell, 12-5/8 inches ID by 178 inches inside length by 1/4-inch thick, located within the inner cask cavity. The containment vessel is closed and sealed by a 5-inch thick, composite steel and uranium closure head, twelve, 1-inch diameter bolts, and a silver plated, metallic O-ring. Eight of the twelve closure bolts

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5. (a) Packaging (continued)

(2) Description (continued)

are used to secure the containment vessel to the upper cask forging. Closure of the cask cavity is by a 1-1/2-inch thick steel closure head, eight, 1-inch diameter bolts, and elastomer O-ring. The radioactive contents are positioned and supported within the containment vessel (inner container) by an aluminum basket and internal support structure.

Configuration (B): The containment vessel is the 1/2-inch thick inner cavity shell. The 1/4-inch thick inner container is not used. The cask cavity is closed by two closure heads. The inner head is a 6-inch thick, composite steel and uranium plate secured to the upper cask forging by twelve, 1-inch diameter bolts and sealed with a silver plated, metallic O-ring. The outer head is 1-1/2-inch thick steel plate secured to the top of the upper cask forging by eight, 1-inch diameter bolts and sealed with an elastomer O-ring. The radioactive contents are positioned and supported within the containment vessel (inner cask cavity) by a modified aluminum basket and internal support structure.

The package, including impact limiters, has an overall length of 237 inches and an outside diameter of 75 inches. The maximum weight of the contents is 1,600 pounds. The weight of the package is approximately 47,500 pounds.

(3) Drawings

The Model No. NLI-1/2 shipping cask is constructed in accordance with the following National Lead Company Drawing Nos.:

General

70514F, Sheet 1, Rev. 7, Cask and Trailer General Arrangement
70514F, Sheet 2, Rev. 8, Cask and Trailer General Arrangement
70885F, Sheet 1, Rev. 3, Spent Fuel Cask Details
70885F, Sheet 2, Rev. 2, Spent Fuel Cask Details
70885F, Sheet 3, Rev. 2, Spent Fuel Cask Details
70885F, Sheet 4, Rev. 1, Spent Fuel Cask Details
70887F, Sheet 1, Rev. 1, Outer Closure Head

Configuration (A)

70516F, Sheet 1, Rev. 8, Spent Fuel Cask General Assembly
70562F, Sheet 1, Rev. 8, Inner Container
70562F, Sheet 2, Rev. 4, Inner Container

Configuration (B)

70888F, Sheet 1, Rev. 3, Spent Fuel Cask General Assembly
70886F, Sheet 1, Rev. 2, Basket Concept
70884F, Sheet 1, Rev. 2, Inner Closure Head

(b) Contents

(1) Type and form of material

(i) Irradiated PWR or BWR uranium oxide fuel assemblies of the following specifications:

	<u>PWR</u>	<u>BWR</u>
Fuel form	Clad UO ₂ pellets	Clad UO ₂ pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial fuel pin pressure at 100°F, psig	550	200
Maximum initial U content/assembly, kg	475	197
Maximum average initial U235 enrichment, w/o	3.70	2.65
Maximum bundle cross section, inches	8.75	5.75
Fuel pin array size	14x14/15x15 16x16/17x17	7x7 8x8
Maximum active fuel length, inches	144	144
Maximum specific power, kw/kgU	40	27
Maximum average burnup, MWD/MTU	40,000**	34,000
Minimum cooling time, days	150*	120

The PWR type assembly may be shipped either with or without burnable poison rods or control rods.

*Four (4) fuel rods may have minimum cooling time of 120 days.

**PWR fuel assembly may have a maximum average burnup of 56,000 MWD/MTU provided the minimum cooling time prior to shipment is 450 days and the neutron shield fluid contains 1.0 weight percent boron. (The borated fluid may be left in the shielding tanks during the shipment of other contents.)

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5. (b) Contents (continued)

(1) Type and form of material (continued)

- (ii) Solid, non-fissile, irradiated hardware and neutron source components
- (iii) Byproduct and special nuclear material in the form of irradiated uranium and plutonium oxide fuel rods. Prior to irradiation, the maximum enrichment in U-235 plus plutonium not to exceed 3.70 w/o.
- (iv) Irradiated PWR uranium oxide fuel assemblies including additional irradiated fuel rods inserted and secured in the guide thimbles. The fuel assemblies shall conform to the maximum active dimensions as described in Item 5(b)(1)(i) except that maximum initial U content shall be 495 kg and the maximum average initial U-235 enrichment shall be 3.35 w/o.

(2) Maximum Quantity of material per package

The maximum decay heat load per package not to exceed 10.6 kilowatts, and:

- (i) Items 5(b)(1)(i) or 5(b)(1)(iv) above: one (1) PWR fuel assembly; or two (2) BWR fuel assemblies.

Above assemblies to be contained in their respective fuel baskets as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 8 or 70886F, Sheet 1, Rev. 2.

- (ii) Item 5(b)(1)(ii) above, weight not to exceed 1,600 pounds.
- (iii) Item 5(b)(1)(iii) above, the maximum mass of U-235 plus plutonium shall not exceed 4.0 kg. Fuel rods shall be contained in fuel baskets as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 8 or 70886F, Sheet 1, Rev. 2.

(c) Fissile Class III

Maximum number of packages
per shipment One (1)

6. The cask cavity and containment vessel (inner container) must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity and containment vessel by the methods described in Section XV of the Application. Removal of residual moisture from cask cavity when package is used in Configuration (B) is not required providing the decay heat load does not exceed 2.0 kw.
7. For the shipment of irradiated fuel assemblies, the cask cavity and containment vessel must be promptly inerted following removal of the water from the cavity. For contents not vacuum dried, the cask cavity and containment vessel must be purged at least three (3) times with argon, nitrogen, or helium. Each purge volume must be equivalent to or greater than the cask cavity and containment vessel volume. After the final purge, or following vacuum drying, the cavity and containment vessel must be promptly filled with argon, nitrogen, or helium at 1.0 atm pressure.

Page 5 - Certificate No. 9010 - Revision No. 13 - Docket No. 71-9010

8. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks must be shipped in Configuration (A).
9. Prior to each shipment, the package must meet the tests and criteria specified in Section XVI of the Application.
10. The neutron shielding tank must be filled with a mixture of water and ethylene glycol (52% by volume). This mixture must not freeze or precipitate in a temperature range from -40°F to 330°F.
11. The structures used to support the package on the transport vehicle must be as described in the Application.
12. Any system used for cooling down the package must be provided with a pressure relief device set so that during the cool-down process, the maximum pressure in the containment vessel cannot exceed 310 psig when the package is used in Configuration (A) or 365 psig when the package is used in Configuration (B).
13. The systems and components of each packaging must meet the periodic tests and criteria specified in Section XVI of the Application.
14. Repair and maintenance must be as described in Section XVI of the Application.
15. As needed, appropriate component spacers must be used in the cask cavity to limit movement of contents during shipment.
16. Prior to first use, each packaging must meet the acceptance tests and criteria specified in Sections XIII and XIV of the Application when used in Configuration (A) and in Appendix A to Sections XIII and XIV when used in Configuration (B).
17. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
18. Expiration date: March 31, 1985.

REFERENCES

NL Industries, Inc. application dated March 7, 1980.
 Supplement dated: July 11, 1980.
 Nuclear Assurance Corporation supplements dated: September 9, 1982; and March 14 and 23, May 24, and June 29, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: APR 13 1984

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9011	3	USA/9011/B()	1	2

2. PREAMBLE

- 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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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

- PREPARED BY (Name and Address):
- TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Advanced Medical Systems, Inc.
1020 London Road
Cleveland, OH 44110

Picker Corporation application dated
September 25, 1973.

c. DOCKET NUMBER 71-9011

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.: E-MEH-00-00004

(2) Description

An overpack that provides impact and thermal protection for a teletherapy head assembly. The cubical overpack consists of laminated 2 x 4 hardwood maple panels bolted together and covered with 16 gage steel panels. Reinforcing steel straps and angles are welded together and spaced to limit the openings between them to less than 6 inches. Skid runners are provided to facilitate fork lift usage. Dimensions of the overpack are 36" x 42" x 40.5" with a maximum gross weight of 4000 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Picker Corporation Drawing Nos.: D-MEH-00-00004, Sheets 2 thru 10; with teletherapy head Drawing Nos.; A-40064; A-40066; A-40063; A-40065; A-42209 (A thru D); A-42208A; A-0067; A-42211; A-T22-86; C-3800-A; A-42208 (A thru D); E-182545A, and E-18972A.

Page 2 - Certificate No. 9011 - Revision No. 3 - Docket No. 71-9011

5. (b) Contents

(1) Type and form of material

Cobalt 60 sealed sources that meet the requirements of special form radioactive material. The sources are to be packaged in a secondary inner container (teletherapy head) as described in Item 5(a)(3).

(2) Maximum quantity of material per package

13,680 curies, with a radioactive decay heat load not to exceed 200 watts.


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

7. Expiration date: March 31, 1986.

REFERENCE

Picker Corporation application dated September 25, 1973.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9013	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9013/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address):
Department of Agriculture
Radiological Safety Staff
Beltsville, MD 20705

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Department of Agriculture application dated
February 5, 1981, as supplemented

c. DOCKET NUMBER **71-9013**

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 Nos.: DA520 and DA521
- (2) Description

The packages are cylindrical, steel-encased, lead filled, weldments consisting of two main units, the biological shield and a movable rotor. The main biological shield has a 5/8-inch outer carbon steel wall and a 3/8-inch thick inner stainless steel wall. A stationary center core is part of the main shield and is constructed of 3/8-inch thick stainless steel material. The movable rotor unit contains three specimen chambers spaced 120° apart. It consists of a 3/8-inch thick stainless steel housing filled with lead and rotates around the center core. Within the main shield are three line sources, located 120° apart about the center of the irradiation position. The packages are 3-1/2 inches in diameter by 40 inches long. The entire package is surrounded by a metal heat shield which bolted to the shipping pallet. The packaging maximum gross weight is 18,500 lbs. Differences between the Model Nos. are minor:

<u>Item</u>	<u>Model No. DA520</u>	<u>Model No. DA521</u>
Source	rectangular	cylindrical
Rotor Ass., front	straight	stepped
Base Ass.	solid, all welded	removable center section plus 1/4" plates

Page 2 - Certificate No. 9013 - Revision No. 2 - Docket No. 71-9013

5. (a) (3) Drawings

The packaging is constructed in accordance with Radiation International, Inc., Drawings Nos.:

80017, Rev. 0 or B	Irradiator
400229, Rev. 0 or C	Cover Assembly, Rotor Housing
400230, Rev. 0 or B	Housing, Rotor
400231, Rev. 0 or A	Rotor Assembly
400232, Rev. 0 or A	Base Assembly
400261, Rev. 0 or A	Irradiator Shipping Assembly
400265, Rev. 0	Heat Shield

(b) Contents

(1) Type and form of material

Doubly encapsulated, stainless steel, cylindrical, Cs-137 sources, as shown on Radiation International, Inc. Drawing No. 100485, Rev. 0 or 100591, Rev. 0.

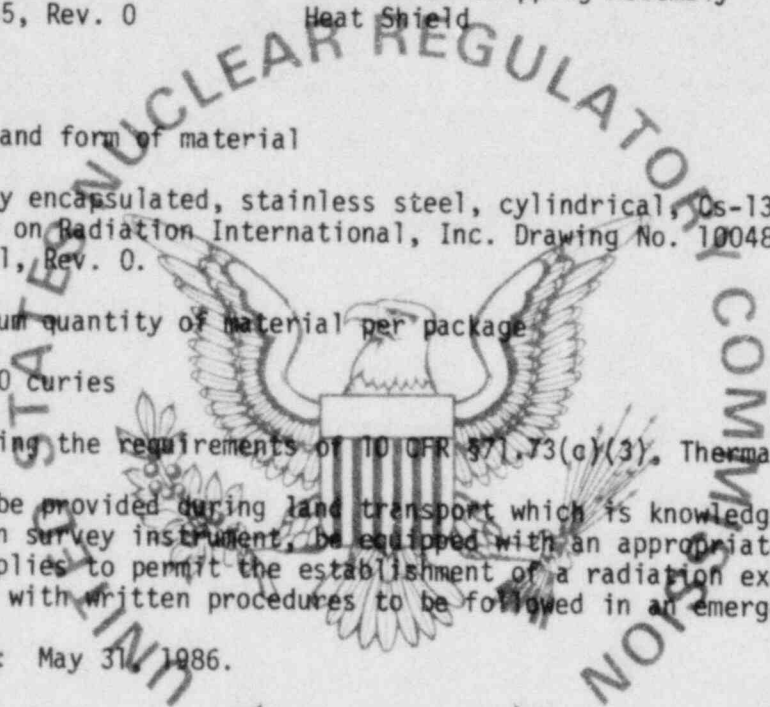
(2) Maximum quantity of material per package

46,800 curies

6. In lieu of meeting the requirements of 10 CFR §71.73(c)(3), Thermal:

An escort must be provided during land transport which is knowledgeable in the use of radiation survey instrument, be equipped with an appropriate survey instrument, supplies to permit the establishment of a radiation exclusion area, and be provided with written procedures to be followed in an emergency situation.

7. Expiration date: May 31, 1986.



REFERENCES

Department of Agriculture application dated February 5, 1981.

Supplement dated: May 15, 1981.

FOR THE U. S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
9015	8	USA/9015/B()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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Transnuclear, Inc.
One North Broadway
White Plains, NY 10601

Transnuclear, Inc. application dated
April 9, 1980, as supplemented.

c. DOCKET NUMBER 71-9015

4. CONDITIONS

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

(a) Packaging

- (1) Model Nos.: TN-8 and TN-8L
- (2) Description

Lead, steel and resin shielded irradiated fuel shipping casks. The cask approximates a right circular cylinder 1,718 mm in diameter and 5,516 mm long. The cavity consists of three (3) stainless steel square pressure vessels welded to an end plate and a circular stepped top flange, separated by a T-shaped copper plate and surrounded with B4C + Cu plates. Each cavity is 230 x 230 mm and 4,280 mm long. The main shielding consists of 135 mm of lead, 25 mm of steel and 150 mm of resin. A wet cement layer is located between the lead and the outer shell. Radial copper fins are welded to the outer shell and cover the surface of the cask between each end drum. The Model No. TN-8 has 150 rows of fins and the Model No. TN-8L has 104 rows of fins.

The lid is a welded stainless steel shell containing lead and resin shields. The pressure vessels are closed and sealed by sixteen (16), 1-1/4-inch diameter bolts and two silicone rubber or Viton O-rings located within recessed grooves on the top flange. Each extremity of the cask is surrounded by circular stainless steel drums reinforced by radial gusset plates and filled with balsa wood. A disk shaped impact limiter, constructed of carbon steel and balsa wood is fastened to each drum with four (4), 1-1/4-inch bolts. The vent and drain lines which penetrate the inner cavity are equipped with positive closures. In addition, all access ports are protected by the impact limiters.

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5. (a) Packaging (continued)

(2) Description (continued)

Trunnions are used for lifting and tie-down of the package. The casks weigh approximately 36,000 kg.

(3) Drawings

The Model No. TN-8 packaging is constructed in accordance with Transnuclear Drawing No. 9317.01, Rev. J. The Model No. TN-8L is constructed in accordance with Transnuclear Drawing No. 9317.138, Rev. A. The materials of construction and welds shall be in accordance with Annex A, B, and C to Chapter II of the Application.

(b) Contents

(1) Type and form of material

Irradiated PWR uranium oxide fuel assemblies of the following specifications:

Fuel form	Clad UO ₂ Pellets
Cladding material	Zr or SS
Maximum initial U content/assembly, kg	469
Maximum average initial U-235 enrichment, w/o	3.2
Maximum bundle cross section, in	8.5
Maximum active fuel length, in	144
Minimum cooling time, day	150
Maximum weight/fuel assembly, kg	733; and

(i) Group I fuel assemblies

Initial fuel pin pressure at 100°F, psig	250
Maximum average burnup, MWD/MTU	38,500; or

(ii) Group II fuel assemblies

Maximum average burnup, MWD/MTU	36,000
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5. (b) Contents (continued)

(2) Maximum quantity of material per package

(i) For the contents described in Item 5(b)(1)(i):

Three (3) PWR assemblies. The maximum decay heat load is not to exceed 35.5 kilowatts per package and 12 kilowatts per assembly for the Model No. TN-8 packaging and 23.7 kilowatts per package and 7.9 kilowatts per assembly for the Model No. TN-8L packaging.

(ii) For the contents described in Item 5(b)(1)(ii):

Three (3) PWR assemblies. The maximum decay heat load and the maximum free gas volume are not to exceed the limits listed in the table below:

Decay Heat per Assembly, kw (a)	Maximum Free Gas per Assembly, m ³ (NTP) (b)
0.5	0.186
1.0	0.181
3.0	0.161
5.0	0.147
7.0	0.136
9.0	0.128

Notes: (a) Decay heat load per assembly shall not exceed 7.9 kilowatts for TN-8L packaging.
(b) NTP conditions are 25°C and one (1) bar.

- (iii) PWR assemblies may be shipped either with or without burnable poison rod, thimble plug, or control rod assemblies.
- (iv) As needed, appropriate component spacers may be used in the cask cavity to properly position the fuel assemblies.
- (v) The maximum weight of the contents (fuel assemblies, component spacers, inserts, etc.) shall not exceed 2,200 kg.

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

6. The cask cavity must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity by the methods described in Annex I to Chapter VIII of the Application. The cavity must be promptly backfilled with 1.0 atm of helium, nitrogen, or argon gas.

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7. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.
8. Prior to each shipment, the package must meet the tests and criteria specified for each shipment (operation) in Chapter VIII of the Application, as amended May 3, 1983 (Chapter 6.0, Operations Program).
9. The package contents must be so limited that under normal conditions of transport, the total dose rates must not exceed 17 mrem/hr at one meter from the surface of the package.
10. Any system used for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the containment vessel cannot exceed 7 atmospheres during the cool-down process.
11. The systems and components of each packaging must meet the periodic tests and criteria specified in Chapter VIII of the Application. Each packaging that fails to meet these criteria must be withdrawn from service until corrective action has been completed.
12. Repair and maintenance of the packaging must be as described in Chapter VIII of the Application.
13. All valves, fittings, seals and relief devices must be of the type, size, model and manufacture as indicated on the design drawings. The resin material must be of the specifications stated in Annex A to Chapter II of the Application.
14. Prior to first use, each packaging must meet the acceptance tests and criteria specified in Chapter VIII of the Application, as amended.
15. In accordance with Annex L to Chapter VIII, at periodic intervals not to exceed two (2) years, the thermal performance of the cask must be analyzed to verify that the cask operation has not degraded below that which is licensed*. Following the initial acceptance tests, the heat source may be that provided by the decay heat from the loading of the package, provided that the heat source is equal to at least 25% of the design heat load for the package. Each cask that fails to meet the thermal acceptance criteria given in Annex L of the Application must be withdrawn from service until corrective action can be completed or the license amended to limit the package to a lower heat load.

* The thermal performance test is not required at periodic intervals when the maximum decay heat load per package does not exceed 25% of the design heat load.
16. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
17. Expiration date: June 30, 1985.

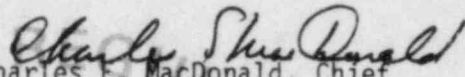
Page 5 - Certificate No. 9015 - Revision No. 8 - Docket No. 71-9015

REFERENCES

Transnuclear, Inc. application dated April 9, 1980.

Supplements dated: October 31, 1980; June 17, 1981; May 3, and 27, 1983; and May 1, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Dated: MAY 18 1984



**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
9016	6	USA/9016/B()F	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Transnuclear, Inc.
One North Broadway
White Plains, NY 10601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Transnuclear, Inc. application dated
April 9, 1980, as supplemented.

c. DOCKET NUMBER

71-9016

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.: TN-9

(2) Description

A lead, steel resin shielded irradiated fuel shipping cask. The cask approximates a right circular cylinder 1,718 mm in diameter and 5,756 mm long. The cavity consists of three rectangular, stainless steel pressure vessels welded to end plates and a circular stepped top flange and separated by thin copper plates. The bays are divided into a total of seven (7) square compartments, 150 x 150 mm and 4,520 mm long. The main shielding consists of 128 mm of lead, 26 mm of steel and 150 mm of resin. A wet cement layer is located between the lead and the outer shell. Radial copper cooling fins are welded to the outer shell and cover the surface of the cask between each end drum.

The lid is a welded stainless steel shell containing lead and resin shields. The pressure vessel is closed and sealed by sixteen (16), 1-1/4-inch diameter bolts and two silicone rubber or Viton O-rings located within recessed grooves on the top flange. Each extremity of the cask is surrounded by circular stainless steel drums reinforced by radial gusset plates and filled with balsa wood. A disk shaped impact limiter, constructed of carbon steel and balsa wood, is fastened to each drum with four (4), 1-1/4-inch bolts. The vent and drain lines which penetrate the inner cavity are equipped with positive closures. In addition, all access ports are protected by the impact limiters.

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5. (a) Packaging (Continued)

(2) Description (Continued)

Trunnions are used for lifting and tie-down of the package. The cask weighs approximately 36,000 kg.

(3) Drawings

The package is constructed in accordance with Transnuclear Drawing No. 9317.03, Rev. J. The materials of construction and welds shall be in accordance with Annex A, B, and C to Chapter II of the Application.

(b) Contents

(1) Type and form of material

Irradiated BWR uranium oxide fuel assemblies of the following specifications:

Fuel form	Clad UO ₂ Pellets
Cladding material	Zr ² or SS
Initial fuel pin pressure at 100°F, psig	200
Maximum initial U content/assembly, kg	201
Maximum average initial U-235 enrichment, w/o	2.65
Maximum bundle cross section, in	5.52
Maximum active fuel length, in	144
Average burnup, MWD/MTU	36,500
Minimum cooling time, day	150
Maximum weight/fuel assembly, kg	300

(2) Maximum quantity of material per package

Seven (7) BWR assemblies. The maximum decay heat load per package is not to exceed 24.4 kilowatts and 3.5 kilowatts per assembly. As needed, appropriate component spacers may be used in the cask cavity to properly position the fuel assemblies. The maximum weight of the contents (fuel assemblies, component spacers, etc.) shall not exceed 2,110 kg.

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

Page 3 - Certificate No. 9016 - Revision No. 6 - Docket No. 71-9016

6. The cask cavity must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity by the methods described in Annex I to Chapter VIII of the Application. The cavity must be promptly backfilled with 1.0 atm of helium, nitrogen, or argon gas.
7. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.
8. Prior to each shipment, the package shall meet the tests and criteria specified for each shipment (operation) in Chapter VIII of the Application.
9. The package contents shall be so limited that under normal conditions of transport, the total dose rates shall not exceed 14 mrem/hr at one meter from the surface of the package.
10. Any system used for cooling down the package shall be provided with a pressure relief device set so that the maximum pressure in the containment vessel cannot exceed 7 atmospheres during the cool-down process.
11. The systems and components of each packaging shall meet the periodic tests and criteria specified in Chapter VIII of the Application. Each packaging that fails to meet these criteria shall be withdrawn from service until corrective action has been completed.
12. Repair and maintenance of the packaging shall be as described in Chapter VIII of the application.
13. All valves, fittings, seals and relief devices shall be of the type, size, model and manufacture as indicated on the design drawings. The resin material shall be of the specifications stated in Annex A to Chapter II of the Application.
14. Prior to first use, each packaging shall meet the acceptance tests and criteria specified in Chapter VIII of the Application.
15. In accordance with Annex L to Chapter VIII, at periodic intervals not to exceed two (2) years, the thermal performance of the cask shall be analyzed to verify that the cask operation has not degraded below that which is licensed*. Following the initial acceptance tests, the heat source may be that provided by the decay heat from the loading of the package, provided that the heat source is equal to at least 25% of the design heat load for the package. Each cask that fails to meet the thermal acceptance criteria given in Annex L of the Application shall be withdrawn from service until corrective action can be completed or the license amended to limit the package to lower heat load.

* The thermal performance test is not required at periodic intervals when the maximum decay heat load per package does not exceed 25% of the design heat load.
16. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
17. Expiration date: June 30, 1985.

Page 4 - Certificate No. 9016 - Revision No. 6 - Docket No. 71-9016

REFERENCES

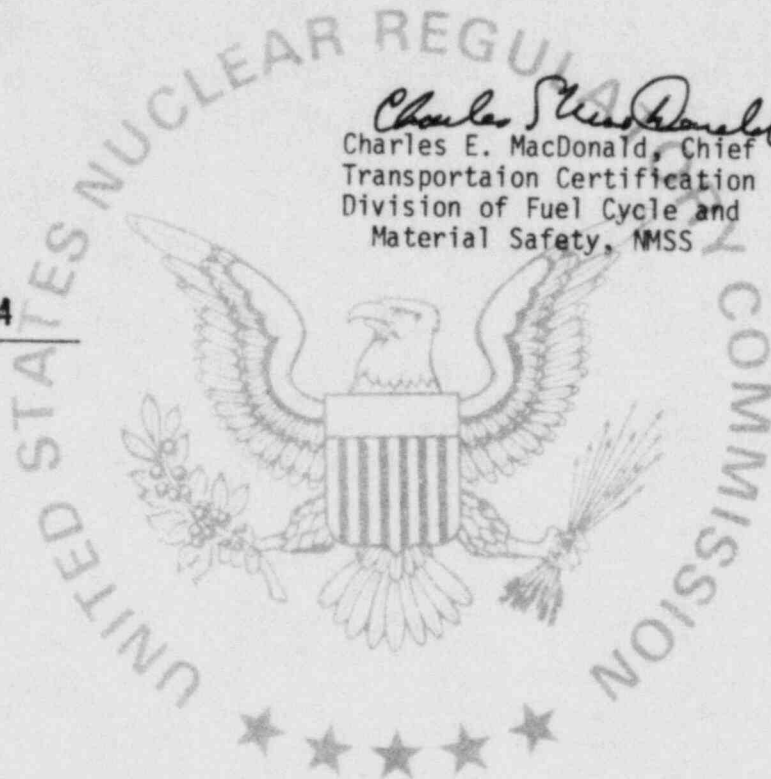
Transnuclear, Inc. application dated April 9, 1980.

Supplements dated: May 27 and July 29, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 13 1984



CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER 9017	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/9017/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Department of the Navy
Naval Support Force Antarctica
FPO San Francisco, CA 96601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Department of the Navy application dated
May 3, 1983.

c. DOCKET NUMBER

71-9017

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.: SNAP-23A Model No. 1000
- (2) Description

A radioisotopic power generator, consisting of an encapsulated fuel source confined within a uranium-8 w/o molybdenum shielded, metal inner container which is positioned in an insulated outer container and the entire assembly housed within a protective overpack

The contents are positioned within a U-8 w/o Mo by an upper and lower metal jacket. The upper stainless steel jacket and the lower Inconel-718 jacket are bolted together. A thin lining of copper between the lower jacket and the shield serves as an accumulator while the upper jacket is copper filled. The heat source assembly is in the shape of a bottle, with the upper jacket being the "neck" of the bottle. The heat source assembly is positioned within a protective metal cover with a radiator mounted inside of the perforated upper portion of the cover. The assembly is supported by hollow tube struts and the space between the cover and assembly is filled with Min-K 2002, thermal insulation. The protective cover is placed in a shipping container for transport. The container consists of a steel upper and lower portion, crushable material, an air bag suspension system, and a lifting device on the top. The weight of the generator and shipping container is approximately 1,800 pounds.

Page 2 - Certificate No. 9017 - Revision No. 3 - Docket No. 71-9017

5. (a) (3) Drawings

The packaging is constructed in accordance with Hittman Nuclear and Development Corporation Drawing Nos.:

- | | |
|----------------------|----------------------|
| HN-602-100-1, Rev. 0 | HN-602-100-8, Rev. A |
| HN-602-100-2, Rev. 0 | HN-602-100-9, Rev. A |
| HN-602-100-3, Rev. 0 | HN-602-300-2, Rev. 0 |
| HN-602-100-4, Rev. 0 | HN-602-300-3, Rev. 0 |
| HN-602-100-5, Rev. 0 | HN-602-300-4, Rev. 0 |
| HN-602-100-6, Rev. 0 | HN-602-300-5, Rev. 0 |
| HN-602-100-7, Rev. 0 | |

and Westinghouse Astronuclear Laboratory Drawing No.:

940J032, Rev. I.

(b) Contents

(1) Type and form of material

Strontium 90 titanate, doubly encapsulated within a 0.065-inch thick liner of Hastelloy C, which in turn is encapsulated inside a 0.4-inch thick Hastelloy C capsule.

(2) Maximum quantity of material per package

165,000 curies and 1,100 thermal watts.

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

7. Expiration date: June 30, 1988.

★ REFERENCE ★

Department of the Navy application dated May 3, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
9018	4	USA/9018/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 780
Wilmington, NC 28401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application
dated May 24, 1974.

71-9018

c. DOCKET NUMBER

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.: BU-6.

(2) Description

The packaging consists of a one-half gallon, minimum 26-gauge steel inner container with a bolted and gasketed top flange closure. The inner container, 5-1/8 inches in diameter by 5-3/4 inches in height (inside dimensions), is centered and supported within an outer 10-gallon capacity, 18-gauge steel drum by a solid insulating media composed of vermiculite and plyamine bonding material.

(3) Drawing

The container, Military Standard Specification No. 27684-7, is constructed in accordance with Fig. 1.7.1, Appendix D, of General Electric Company's application dated May 24, 1974.

(b) Contents

(1) Type and form of material

- (i) Uranium compounds with a maximum bulk density not greater than 10.96 grams/cc. which together with any other associated materials do not decompose at temperatures up to 190°F. Uranium may be enriched to a maximum 4.0 w/o in the U-235 isotope.

Page 2 - Certificate No. 9018 - Revision No. 4 - Docket No. 71-9018

(b) Contents (continued)

(ii) Uranium oxides with a maximum bulk density not greater than 10.96 grams/cc. Uranium may be enriched to a maximum 5.0 w/o in the U-235 isotope. The maximum H/U-235 atomic ratio considering all sources of hydrogenous material within the inner container shall not exceed 0.45.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i):

The maximum contents per package for the maximum U-235 enrichment shall be limited in accordance with the following table:

Maximum U-235 enrichment, w/o	Maximum UO ₂ per package, kgs
3.0	44.5
3.2	38.9
3.4	34.6
3.6	31.1
3.8	28.3
4.0	25.7

(ii) For the contents described in 5(b)(1)(ii):

The maximum contents per package for the maximum U-235 enrichment shall be limited in accordance with the following table:

Maximum U-235 enrichment, w/o	Maximum UO ₂ per package, kgs
3.0	44.5
3.2	38.9
3.4	34.6
3.6	31.1
3.8	28.3
4.0	25.7
4.2	23.7
4.4	21.9
4.6	20.2
4.8	19.1
5.0	18.1

(c) Fissile Class

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Page 3 - Certificate No. 9018 - Revision No. 4 - Docket No. 71-9018

6. The four, 1/4-inch diameter holes located near the top of the outer drum as shown in Fig. 1.7.1 shall be covered with weatherproof tape to preclude the entry water.
7. The density of the package insulation shall not be less than 6.88 grams/in³.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: June 30, 1989.

REFERENCE

General Electric Company application dated May 24, 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, MSS

Date: JUN 28 1984

**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
9019	10	USA/9019/AF	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
General Electric Company P.O. Box 780 Wilmington, NC 28401	General Electric Company application dated June 3, 1981, as supplemented.

c. DOCKET NUMBER 71-9019

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.: BU-7.

(2) Description

The packaging consists of either two, 5-gallon or three, 2.5 or 3-gallon, 11.25-inch ID, minimum 24-gauge steel pails contained in a 13.75-inch diameter by 27-inch long inner container constructed of minimum 18-gauge steel, with bolted and gasketed top flange closure. The inner container is centered and supported in a 22.5-inch ID, 18-gauge steel 55-gallon capacity DOT Specification 17H steel drum by solid insulating material composed of fire-retardant phenolic foam. The maximum weight of the package is 370 pounds.

(3) Drawing

The container is constructed in accordance with General Electric Company Drawing No. 112D1592, Revision 1.

5. (b) Contents

(1) Type and form of material

- (i) Uranium oxide powder with a maximum bulk density not greater than 4.2 grams/cc. Uranium may be enriched to not more than 4.0 w/o in the U-235 isotope. The maximum H/U atomic ratio considering all sources of the hydrogenous material within the inner container shall not exceed 0.45.
- (ii) Uranium oxide powder with a maximum bulk density not greater than 4.2 grams/cc. Uranium may be enriched to not more than 4.0 w/o in the U-235 isotope. The maximum H/U atomic ratio considering all sources of the hydrogenous material within the inner container shall not exceed 1.6.
- (iii) Uranium oxide as pellets with a maximum bulk density of 4.2 grams/cc. Uranium may be enriched to a maximum 4.0 w/o in the U-235 isotope.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i):

The maximum contents per package and pail for the maximum U-235 enrichment shall be limited in accordance with the following table:

Maximum U-235 enrichment, w/o	Maximum UO ₂ per pail, kgs	Maximum UO ₂ per package ² kgs
3.0	44.5	89.0
3.2	38.9	77.8
3.4	34.6	69.2
3.6	31.1	62.2
3.8	28.3	56.6
4.0	25.7	51.4

(ii) For the contents described in 5(b)(1)(ii):

The maximum contents of uranium oxide powder per package and pail shall be limited to 70 kgs and 35 kgs, respectively.

Page 3 - Certificate No. 9019 - Revision No. 10 - Docket No. 71-9019

(iii) For the contents described in 5(b)(1)(iii):

The maximum contents per package and pail for the maximum U-235 enrichment shall be limited in accordance with the following table:

Maximum U-235 enrichment, w/o	Maximum UO ₂ per pail, kgs	Maximum UO ₂ per package, kgs
2.7	45.0	90.0
2.8	42.9	85.8
2.9	40.1	80.2
3.0	38.1	76.2
3.2	34.1	68.2
3.4	31.0	62.0
3.6	28.5	57.0
3.8	26.4	52.8
4.0	24.7	49.4

(c) Fissile Class

6. For mixtures of contents (powders and pellets) described in 5(b)(1), the maximum quantity of material per package shall be limited to the quantity given in 5(b)(2)(iii).
7. For mixtures of contents as described in 5(b)(1)(ii), ammonium oxalate and/or ammonium bicarbonate additives are permitted in the UO₂ powder to the extent that the C/U ratio does not exceed 1.27.
8. The four, 1/4-inch diameter holes located near the top of the outer DOT Specification 17H steel drum shall be covered with weatherproof tape to preclude the entry of water.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: April 30, 1989. ★ ★ ★ ★

REFERENCES

General Electric Company application dated June 3, 1981.

Supplement dated: June 25, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

APR 24 1984

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9020	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/9020/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Containers, Incorporated
P.O. Box 1030
Elizabethton, TN 37643

Nuclear Containers, Incorporated application
dated June 28, 1974, as supplemented.

c. DOCKET NUMBER

71-9020

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.: SL-10-1

(2) Description

A shielded packaging for liquids and solids. The outer container is constructed from two, 16-gauge 55-gallon steel drums welded end-to-end, and having overall dimensions of 69-inches by 22-1/2-inches diameter. The outer container closure is accomplished by a reinforced drum lid, bolted to a nut ring using eight, 1/2"-13UNC hex head bolts. The containment vessel has a usable cavity 5.047-inch diameter by 53-3/8-inch long, constructed of 304L stainless steel. Closure is accomplished by a 5-inch, 300-pound blind flange, provided with a 1/4-inch valve, sealed by a pipe cap (threads wrapped with teflon tape) and protected by a steel enclosure. A double Viton-A O-ring arrangement seals the containment vessel. Provisions are made to leak test the closure lid seal. Shielding is provided by a 1/2-inch thick lead annulus within a 6-inch OD, 1/8-inch inner sleeve and a 7-1/2-inch OD, 1/4-inch outer steel sleeve. The space between the outer container and the containment vessel is filled with WEP (water extended polyester) and vermiculite. The weight of the packaging and contents is 1,200 pounds.

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5. (a) Packaging (continued)

(3) Drawings

The SL-10-1 packaging is as described, and constructed in accordance with Nuclear Containers, Incorporated Drawing Nos. DED-182-B, Rev. 4 and DED-183-B, Rev. 4. The double seal gasket is as shown in Drawing No. DED-187-A,

Rev. 1. As an alternate to this configuration a double O-ring flange and O-ring may be provided as shown in Drawing No. DED-169-B, Rev. 2.

(4) Product Containers

- (i) Polyethylene bottles shall meet the specifications for: Slit-vent model per CAPE-1170-37; or Duo-Vent model per Nuclear Fuel Services, Inc., Specification U-1, Drawing No. 5B-U-740.
- (ii) Stainless steel bottles shall meet the specifications given in General Electric Co. Drawing Nos. FRO-140 and FRO-140A.
- (iii) Sealed metal cans, constructed of corrosion resistant materials.

(b) Contents

(1) Type and form of material

- (i) Uranyl nitrate solutions contained within a product container specified in 5(a)(4)(i) or (ii), and having a concentration of uranium 235 not exceeding 350 grams per liter and an H/U-235 atomic ratio not less than 80, provided that the combined U-233 and plutonium content is not more than 1% of the U-235 content; or
- (ii) Uranyl nitrate solutions contained within a product container specified in 5(a)(4)(i) or (ii), and having a combined concentration of uranium 233 and uranium 235 not exceeding 250 grams per liter and an H to fissile material atomic ratio of not less than 80 provided (1) the U-233 content is not greater than 20% of the combined U-233 and U-235 content, and (2) the plutonium content is not more than 1% of the combined U-233 and U-235 content; or
- (iii) Plutonium nitrate solutions contained within a product container specified in 5(a)(4)(i) or (ii) having a concentration not exceeding 250 grams fissile plutonium per liter; or
- (iv) Uranyl sulfate solution (UO_2SO_4) containing uranium enriched in the 235 isotope contained within a product container specified in 5(a)(4)(i); or
- (v) Dry compounds and mixtures of fissile plutonium-uranium 235, contained within a product container specified in 5(a)(4)(i), (ii) or (iii).

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5. (b) Contents (continued)

(2) Maximum quantity of material per package

Not to exceed twenty (20) curies plutonium per package, and

(i) for the contents described in 5(b)(1)(i), (ii), and (iii):

Not more than 10.5 liters of solution.

Maximum decay heat load not to exceed 35 watts.

(ii) For the contents described in 5(b)(1)(iv):

Not more than 10.5 liters of solution and 950 grams fissile material.

Maximum decay heat load not to exceed 30 watts.

(iii) For the contents described in 5(b)(1)(v):

Not more than 4.5 kilograms of fissile material. The hydrogen to fissile material atomic ratio, including all hydrogenous material within the containment vessel shall not exceed 10.

Maximum decay heat load not to exceed 125 watts for solids packed in metal product containers, and 50 watts for solids packed in polyethylene containers.

(c) Fissile Class

I

6. For packaging with a polyethylene product container a flexible restraining device shall be placed between the cap assembly of the polyethylene bottle and the closure flange of the pressure vessel to restrict the relative vibration of the polyethylene bottle with respect to the pressure vessel during transport.
7. Appropriate steps shall be taken to assure that from the time of sealing to the time of delivery to the consignee, the pressure in the containment vessel does not exceed 40 psig.
8. Prior to each shipment of more than Type A quantity of radioactive material, the double O-ring seal must be shown to be leaktight at 100 psig by a method having a leak sensitivity of 10^{-3} atm-cm³/sec at standard temperature and pressure.
9. A test shall be performed on each containment vessel and associated 1/4-inch stainless steel valve (without its associated pipe cap) initially and once each year at 300 psig, demonstrating leaktightness by a method having a leak sensitivity of 10^{-6} atm-cm³/sec at standard temperature and pressure.

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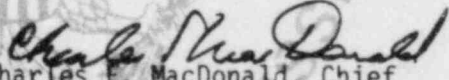
10. The weight of WEP/WEP-vermiculite shielding shall be determined at fabrication by weighting the packaging before and after pouring. The weights must be documented and retained. The final WEP/WEP-vermiculite weight must be more than 500 pounds prior to placing the packaging in service.
11. The empty packaging shall be weighed at the annual inspection. No packaging shall be placed in service which shows a loss of 25 pounds from the initial recorded weight.
12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
13. Expiration date: March 31, 1985.

REFERENCES

Nuclear Containers, Incorporated letter dated June 28, 1974.

Supplements dated: October 14 and 28, 1974; and January 3, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 14 1983

**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
9791	1	USA/9791/B(U)	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20545

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

PWR-2 Lower Core Barrel Safety Analysis Report
for Packaging dated January 1982

c. DOCKET NUMBER

71-9791

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.: PWR-2 Lower Core Barrel Shipping and Disposal Container
- (2) Description

The package consists of an irradiated PWR-2 lower core barrel (LCB) and irradiated LWBR components (non-fuel) packaged in an inner, lead-filled container which is placed inside an outer container. The package weighs approximately 400,000 pounds

The PWR-2 LCB outer container is a 4-inch thick steel cylinder, 127 inches in outside diameter, 212 inches long, with two 6-inch thick end plates. The bottom end plate is welded to the cylinder with a full penetration weld and the top end plate is bolted with 107 2-inch diameter fasteners.

The package is equipped with two 2.5-inch thick by 10-inch long circumferential impact limiter rings on the side and two concentric impact limiter rings and aluminum honeycomb crush blocks on the ends.

The container is supported horizontally on the railroad car by eight gussets attached to two horizontal plates. Each plate is bolted to the top flange of an I-beam. The bottom flange of the I-beam is bolted to a 300-ton railroad car.

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5. (a) (2) Description (continued)

The inner container, which will be disposed of along with the PWR-2 LCB and the irradiated LWBR components, is a cylinder with two steel shells containing lead in between. The inner container is 117 inches O.D. and 181 inches long. The inner steel shell is 1.0-inch thick and the outer steel is 0.5-inch thick. There are 4.25 inches of lead shielding between the shells. The inner container is supported radially in the outer container by two rings, one at each end, which have a radial clearance of 0.25 inches. The inner container is centered axially in the outer container by the aluminum honeycomb crush blocks. The bottom end of the inner container is a 4.5-inch thick plate. The top end of the inner container is an 8-inch thick plate attached to the cylinder with 40 one-inch diameter fasteners. A spiral-wound, graphite filled gasket is located between the bolted cover and the cylinder. The gasket is preloaded by the 40 bolts, which have an applied torque of 700 ft-lb. The inner container is made primarily from HY-80 steel, except for the lead shielding and the top cover, which are made from ASTM A 588.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Drawings Nos. 1575E12 and 1574E96.

(b) Contents

(1) Type and form of material

An irradiated PWR-2 lower core barrel and the following LWBR irradiated contents: (a) six blanket support tubes, (b) 11 seed support shaft assemblies, (c) seven sectioned flux thimbles, and (d) five sectioned BIF supply tubes. In addition, the shipment may include approximately 33 gallons of residual water and surface contamination in the form of activated corrosion products.

(2) Quantity of material in package

One irradiated lower core barrel assembly and irradiated LWBR structurals as described in 5(b)(1). Surface contamination not to exceed 18.9 curies. The irradiated lower core barrel and LWBR structurals not to exceed 32,000 curies.

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6. The package will be operated in accordance with the procedures described in Chapter 7 of the application and Naval Reactors' letter G#84-452 dated March 28, 1984. The package will be tested and maintained in accordance with the procedures in Chapter 8 of the application.
7. Expiration date: November 31, 1988.

REFERENCES

PWR-2 Lower Core Barrel Safety Analysis Report for Packaging, WAPD-LP(CES)CS-670 dated January 1982.

Supplement: Naval Reactors' memorandum G#7241 dated December 2, 1982, and G#84-452 dated March 28, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegarde

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 06 1984

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
9021	7	USA/9021/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Technical Operations, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc. application dated
July 25, 1979.

c. DOCKET NUMBER

71-9021

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.: 750

(2) Description

A portable container which utilizes depleted uranium for shielding. The depleted uranium shielding surrounds a titanium "U" tube which is crimped at the middle of the "U". The titanium source tube is reinforced with a titanium sleeve (2 inches long) located on the upper ends of the "U" tube where the source tube leaves the uranium. The shielding and the "U" tube are encased in a steel bottom housing. The space between the shielding and the bottom steel housing is potted with a polyurethane foam. During transport, the contents are securely positioned in the source tube by the source drive cable locking device. An outer steel top cover is bolted to the bottom steel housing to provide protection to the locking device and containment of the coiled drive cable. Tamper-proof seals are provided on the package. Shipping weight is 70 pounds.

(3) Drawing

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing No. 75090, Sheets 1, 2 and 3 of 3, Revision 0.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 curies

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6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The cable of the source assembly must engage the lock retainer clip. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the cr of the "U" tube.
7. The name plate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: July 31, 1989.

REFERENCE

Technical Operations, Inc. application dated July 25, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 18 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9022	b. REVISION NUMBER 8	c. PACKAGE IDENTIFICATION NUMBER USA/9022/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Combustion Engineering Co., Inc.
1000 Prospect Hill Road
Windsor, CT 06095

Combustion Engineering, Inc. application
dated January 11, 1980, as supplemented.

71-9022

c. DOCKET NUMBER

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.: CE-250-2
- (2) Description

The packaging consists of a 16-gauge steel containment vessel, 11-5/8 inches ID by 57-1/4 inches long with a bolted and gasketed top flange closure and steel welded bottom plate. The containment vessel is centered and supported in a 22-1/2-inch ID by 68-3/8-inch long, 16-gauge steel drum by twelve (12), 1/4-inch diameter spring steel rods welded to the containment vessel at the top flange and the bottom of the vessel. The void space between the containment vessel and outer container is filled with vermiculite.

Closure of the containment vessel is maintained by a gasket (either silicone rubber or asbestos and rubber) and six (6), 1/2-inch hex head bolts and nuts. The outer container closure is made with a 12-gauge bolt locking ring with drop forged lugs, one of which is threaded, having a 5/8-inch diameter bolt and lock nut.

The gross weight of the packaging and contents is approximately 575 pounds.

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(3) Drawing

The packaging is constructed in accordance with Combustion Engineering Company, Inc. Drawing No. NFM-E-Z2175, Revision 00.

(b) Contents

(1) Type and form of material

Dry uranium oxide pellets and powder enriched to a maximum 4.1 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the containment vessel shall not exceed 2.26.

(2) Maximum quantity of material per package

The total contents not to exceed 300 pounds, with the U-235 content not to exceed 4.5 kilograms. The contents shall be contained within sealed steel containers with a maximum cross sectional area of 73.2 square inches.

(c) Fissile Class

II

Minimum transport index to be shown on label

0.6

6. The containment vessel closure gasket (Item No. 12, Drawing No. NFM-E-Z2175, Rev. 00) must be made of silicone rubber, or an Anchor Packing Company gasket "Target" or "425."
7. Spacers and product containers shall be used to provide a snug axial fit of the product containers within the containment vessel.
8. Attachment of handle (Item 18, Drawing No. NFM-EZ2175) to outer lid is not authorized.
9. Alternate closure system shown in Figure 1 of Exxon Nuclear Company, Inc. letter dated August 14, 1980 is authorized.
10. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
11. Expiration date: June 30, 1985.

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REFERENCES

Combustion Engineering, Inc. application dated January 11, 1980.

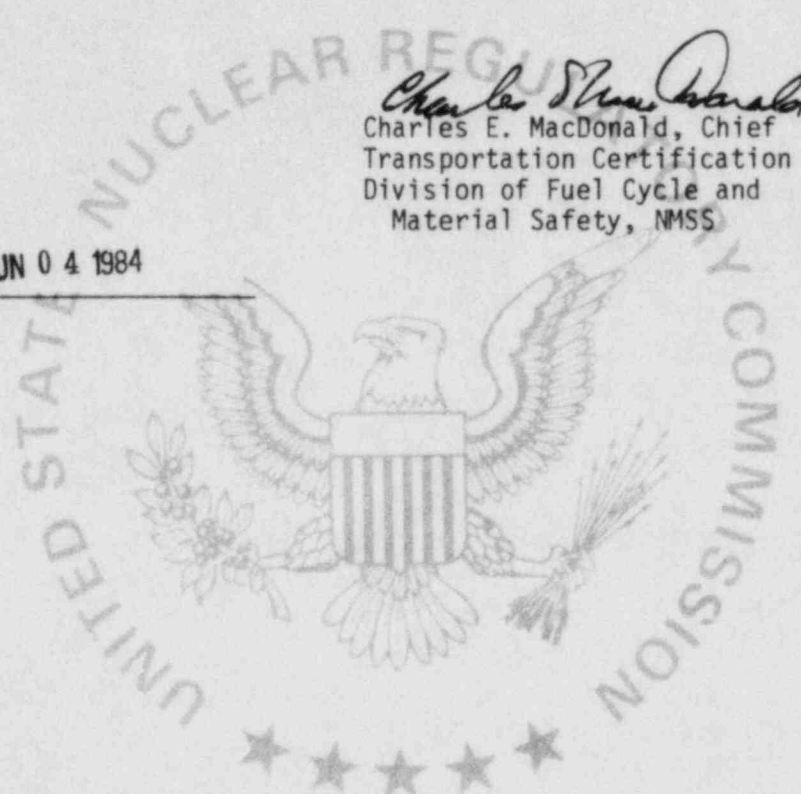
Supplement dated: June 6, 1980.

Exxon Nuclear Company supplement dated: May 13, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 04 1984



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
9023	4	USA/9023/B()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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Assurance Corporation
5720 Peachtree Parkway
Norcross, GA 30092

NL Industries, Inc. application dated
February 27, 1976, as supplemented.

c. DOCKET NUMBER

71-9023

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.: NLI-10/24
- (2) Description

A lead, water, depleted uranium and high temperature polymer shielded shipping cask, encased in stainless steel, equipped with balsa impact limiters, and mounted to a railcar which is considered to be an integral part of the packaging for normal conditions of transport. The cask body is 204-1/2 inches long by 96 inches in OD. The principal shielding consists of 6 inches of lead and 9 inches of water. Depleted uranium plates are encased in the bottom end forging and cask inner closure head. High temperature polymer sheet is encased in the bottom end and positioned between the inner and outer closure heads at the top end.

The lead shield is bonded between a 3/4-inch stainless steel inner shell and a 2-inch stainless steel outer shell. The outer shell is surrounded by a 3/4-inch stainless steel water jacket shell. The three (3) shells are welded to stainless steel forgings at both ends. Four (4) water expansion tanks are mounted to the railcar, and are connected to the water jacket by a flexible metal hose.

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5. (a) Packaging (continued)

(2) Description (continued)

The primary containment vessel is comprised of the 3/4-inch inner shell and the inner closure head. It is 179-1/2 inches long and has a 45-inch inside diameter. The inner closure head is held in place by sixteen (16) bolts, and is sealed with a metallic O-ring. Secondary containment is provided by the outer closure head which is bolted, and has a Viton or silicone O-ring seal. There is no direct penetration between the containment cavity and the ambient. The two (2) penetrations into the containment cavity are from the space between the inner and outer closure heads, which has a single penetration through the cask body connecting it with the ambient. The two (2) lid penetrations are sealed with 1-1/2-inch quick disconnect valves and metal O-ring seals each in a valve box arrangement.

The radioactive contents are positioned within the containment cavity using neutron poisoned aluminum baskets and internal support structures. The PWR and BWR fuel basket cavities are lined with neutron absorber sleeves composed of a silver-indium-cadmium (80-15-5 w/o) alloy.

An auxiliary cooling system, mounted to the railcar, is used to maintain the cask and fuel temperatures so as to facilitate handling and cooldown.

The fully loaded cask, excluding the railcar, is approximately 194,000 pounds, which includes a maximum gross weight of the cavity contents of 34,100 pounds (fuel, spacers, fuel basket, etc.).

(3) Drawings

The Model No. NLI-10/24 shipping cask is constructed in accordance with the NL Industries, Inc. and National Lead Company Drawing Nos. as specified on page XVIII-1, Rev. 9 and page XVIII-2, Rev. 8, in Section XVIII of the Application.

5. (b) Contents

(1) Type and form of material

Irradiated PWR and BWR uranium oxide fuel assemblies of the following specifications:

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5. (b) Contents (1) (continued)

	<u>PWR</u>	<u>BWR</u>
Fuel form	Clad UO ₂ pellets	Clad UO ₂ pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	475	200
Maximum average initial U-235 enrichment, w/o	3.5	2.8
Maximum initial U-235 content/assembly, kg	16.6	5.6
Maximum bundle cross section, inches	9.00	5.75
Fuel pin array size, number of pins	14x14/15x15 16x16/17x17	7x7/8x8
Maximum active fuel length, inches	144	144
Maximum specific power, kw/kgU	40	27
Maximum average burnup, MWD/MTU	35,500	29,700
Minimum cooling time, days	150	150

The PWR type assemblies may be shipped either with or without control rods.

(2) Maximum quantity of material per package

The maximum decay heat load per package not to exceed 70 kilowatts, and:

Ten (10) PWR fuel assemblies or twenty-four (24) BWR fuel assemblies.

Above assemblies shall be contained in their respective fuel baskets as shown on NL Industries, Inc. and National Lead Company Drawing Nos.:

70652F, Sheet 1, Rev. 7 PWR Fuel Basket,
Sheet 2, Rev. 5 10/24 Rail Cask
70653F, Sheet 1, Rev. 7 BWR Fuel Basket,
Sheet 2, Rev. 5 10/24 Rail Cask

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5. (c) Fissile Class III
- | | |
|---|---------|
| Maximum number of packages per shipment for Class III | One (1) |
|---|---------|
6. The maximum gross weight of the cavity contents must not exceed 34,100 pounds (fuel, spacers, basket, etc.).
7. The containment vessel must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the containment vessel by the methods described in Section XVI of the Application. The containment vessel must be promptly filled with helium to 1.0 atm pressure.
8. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.
9. Prior to each shipment, the package must meet the tests and criteria specified in Section XVII of the Application.
10. The cask contents must be so limited under normal conditions of transport that the following measured dose rates be satisfied:
- at one meter from the external radial midplane surface of the package: 625 times the neutron dose rate plus 2.5 times the gamma dose rate will not exceed 1,000 millirems per hour; and
 - at one meter from the external surface of the bottom of the package; 115 times the neutron dose rate plus 2.0 times the gamma dose rate will not exceed 1,000 millirems per hour.
11. The neutron shielding system and auxiliary cooling system must be filled with a mixture of water and ethylene glycol (53% to 58% by weight ethylene glycol).
12. The neutron shielding system must be equipped with two (2) pressure relief valves (one on the cask and one on an expansion tank) set at 220 psig.
13. Any system used for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the containment vessel cannot exceed 233 psig during the cooldown process.
14. The systems and components of each packaging must meet the criteria for the periodic tests specified in Section XVII of the Application.
15. Repair and maintenance must be as described in Section XVII of the Application. During inactive periods, the maintenance and testing program may be disregarded provided that the package is brought into full compliance prior to the next use of the package.

Page 5 - Certificate No. 9023 - Revision No. 4 - Docket No. 71-9023

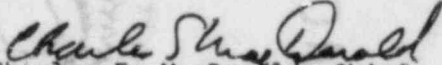
16. Prior to first use, each packaging shall meet the criteria for the acceptance tests specified in Sections XIV and XV of the Application, except that the prototype railcar test meeting the stated design criteria need be performed only once.
17. Packaging is authorized for rail mode of transport only.
18. Expiration date: July 31, 1986.

REFERENCES

NL Industries, Inc. application dated February 27, 1976.

Supplements dated: June 4, 1976; October 10, 1978; and July 6, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 18 1984

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
9024	4	USA/9024/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
St. Louis Testing Laboratories, Inc. 2810 Clark Avenue St. Louis, MO 63103	St. Louis Testing Laboratories, Inc. application dated July 26, 1974, as supplemented.
c. DOCKET NUMBER 71-9024	

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.: STL-201
- (2) Description

A radiographic device contained within a steel drum and wood insulated overpack. Outer dimensions of the overpack are 11 inches in diameter by 14 inches high, conforming to Military Standard MS-27684-2. The dimensions of the device are 4 inches by 5 inches by 9 inches in height. Main components of the device include a 1/8-inch stainless steel encasement shell, 30 pounds of depleted uranium shielding, solidified molten aluminum filler material, "S" shaped source tube, and shipping plug. The radiographic device is centered and positioned within the steel drum by wood insulation. The total weight of the package is approximately 60 pounds.

(3) Drawings

The packaging is constructed in accordance with the following St. Louis Testing Laboratories, Inc. Drawing Nos.:

STL-31A	STL-282
STL-280	STL-283
STL-281	STL-201

and

Military Standard MS-27684-2

Page 2 - Certificate No. 9024 - Revision No. 4 - Docket No. 71-9024

5. (b) Contents

(1) Type and form of material

Iridium 192 as a sealed source which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

100 curies of iridium 192.

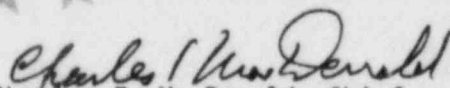
6. The source assemblies authorized for use in radiographic device are limited to Model XC-305 as shown in (AECL) Atomic Energy of Canada Limited Drawing No. A4251-A-9, Model S-1 as shown in General Nuclear, Inc. Drawing No. B-107, and Nuclear Environmental Engineering, Inc. Model S-1 as shown in St. Louis Testing Laboratories Drawing No. STL-285-1.
7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. Drum vent holes must be covered with durable weatherproof tape, or equivalent device.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: February 28, 1985.

REFERENCES

St. Louis Testing Laboratories Inc. application dated July 26, 1974.

Supplements dated: October 17, 1974; and January 9 and February 10, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9027	4	USA/9027/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Tech/Ops
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Tech/Ops consolidated application
dated November 29, 1979; as supplemented.

c. DOCKET NUMBER

71-9027

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 Nos.: 741 and 741E

(2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and an "S" tube. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 300 pounds.

Page 2 - Certificate No. 9027 - Revision No. 4 - Docket No. 71-9027

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos.:

- 74190: Sheet 1, Rev. 0; Sheet 2, Rev. 1; Sheet 3, Rev. 0; Sheet 4, Rev. 1; and Sheet 5, Rev. 0.
- 66025: Sheets 2 and 3, Rev. 0.

(b) Contents

(1) Type and form of material

Cobalt 60 or iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

33 curies of cobalt 60; or
240 curies of iridium 192.

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

7. Expiration date: January 31, 1985.

REFERENCE

Tech/Ops consolidated application dated November 29, 1979.

Supplement dated: February 21, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: MAR 19 1984

**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
9028	4	USA/9028/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc. application
dated September 27, 1979, as supplemented.

c. DOCKET NUMBER 71-9028

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 Nos.: 684 and 684E
- (2) Description

A steel encased uranium shielded Gamma Ray Projector. Primary components consists of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and a Zircalloy "S" tube. The contents are securely positioned in the Zircalloy "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 225 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc., Drawing Nos.:

- 68490, Sheets 1, 2 and 3 of 5
- 68490, Sheets 4 and 5 of 5, Rev. A
- 66025, Sheets 2 and 3 of 3, Rev. A.

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5. (b) Contents

(1) Type and form of material

Cobalt 60 or iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

11 curies of cobalt 60; or
240 curies of iridium 192

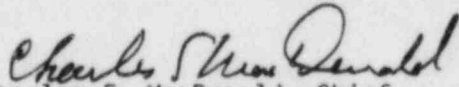
6. The source shall be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The name plates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: December 31, 1984.

REFERENCES

Technical Operations, Inc. application dated September 27, 1979.

Supplement dated: November 9, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
9029	5	USA/9029/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Technical Operations, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Technical Operations, Inc. application dated
September 10, 1979, as supplemented.

c. DOCKET NUMBER

71-9029

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 Nos.: 676 and 676E
- (2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and an "S" tube. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Temper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 545 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos.:

67690, Sheets 1, 2, 3, 4 and 5 of 5, Rev. C
66025, Sheets 2 and 3 of 3, Rev. A

Page 2 - Certificate No. 9029 - Revision No. 5 - Docket No. 71-9029

5. (b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

330 curies.

6. The source shall be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials resisting a 1475°F fire environment of one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: September 30, 1989.

REFERENCES

Technical Operations, Inc. application dated September 10, 1979.

Supplements dated: October 4, 1979; and September 4, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 26 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9030	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/9030/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address) Teledyne Energy Systems 110 West Timonium Road Timonium, MD 21093	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION Martin Company application dated June 16, 1966, as supplemented.
c. DOCKET NUMBER 71-9030	

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 Nos.: MW-3000, Sentinel-3, and Sentinel-8
- (2) Description

The packages are thermoelectric generators. The major components include: the main housing, tungsten shield, housing flange, and electrical connectors. The approximate dimensions and weights for the Model Nos. are as follows:

<u>Model No.</u>	<u>Dimensions (inch)</u>	<u>Weight (lb)</u>
MW-3000, Sentinel-3	24 OD x 23	2,700
Sentinel-8	24 OD x 25	3,200

(3) Drawings

The packagings are constructed in accordance with the following Drawing Nos.:

<u>Model No.</u>	<u>Drawing Nos.</u>
MW-3000, Sentinel 3	Martin Co. Drawing No. 471A1000000
Sentinel-8	Isotopes, Inc. Drawing No. J-30856-003-10000

Page 2 - Certificate No. 9030 - Revision No. 3 - Docket No. 71-9030

5. (b) Contents

(1) Type and form of material

Strontium 90 titanate doubly encapsulated in Hastelloy fuel capsule which meet the requirements of special form radioactive material.

(2) The maximum quantity of material per package

<u>Model No.</u>	<u>Quantity</u>
MW-3000, Sentinel-3	25,000 Curies
Sentinel-8	40,000 Curies

6. Eye-bolts shall be removed or covered during transportation to prevent their use as tie-down devices of packages.
7. The MW-3000, Sentinel-3, and Sentinel-8 shall have their top steel cover plate bolted to the outer wrought steel shield at all times except when maintenance operations are being performed on the generator which require removal of the top steel cover plate.
8. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: July 31, 1985.

REFERENCES

Isotopes, Inc. applications dated: September 15 and 16, 1969; and March 3 and April 20, 1970.

Martin Company application dated June 16, 1966; with supplements dated: July 22 and August 16, 1966.

Isotopes, Inc. application dated November 5, 1968; with supplement dated: December 5, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
9032	4	USA/9032/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc.
40 North Avenue
Burlington, MA 01803

Technical Operations, Inc. application
dated August 8, 1979.

c. DOCKET NUMBER

71-9032

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.: 650

(2) Description

A steel encased, uranium shielded, Iridium 192 source changer. Primary components consist of an outer steel shell, polyurethane potting material, uranium shield, Titanium "U" tube, and source holdown assembly. The source holdown assembly secures the source assembly in position within the crimped "U" tube. Tamper-proof seals and a padlock are provided on the packaging. Total weight of the package is approximately 70 pounds.

(3) Drawing

The packaging is constructed in accordance with the Technical Operations, Inc. Drawing No. 65002, Rev. A, Sheets 1, 2 and 3 of 3.

Page 2 - Certificate No. 9032 - Revision No. 4 - Docket No. 71-9032

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

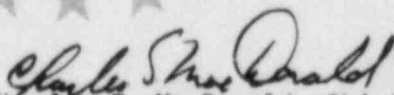
240 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The cable of the source assembly must engage the source holdown assembly. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the crimp of the "U" tube.
7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: June 30, 1989.

REFERENCE

Technical Operations, Inc. application dated August 8, 1979.

FOR THE U. S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 14 1984

**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
9033	5	USA/9033/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Tech/Ops 40 North Avenue Burlington, MA 01803	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Tech/Ops application dated November 8, 1974, as supplemented.
c. DOCKET NUMBER 71-9033	

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 Nos.: 660 and 660E
 - (2) Description
A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, polyurethane potting material, uranium shield, "S" tube, and end plugs. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging. The maximum total weight of the package is approximately 48 pounds.
 - (3) Drawings
The packaging is constructed in accordance with the Technical Operations, Inc. Drawing No. 66025, Sheets 1, 2, and 3, Rev. B and Sheet 4, Rev. -.
 - (b) Contents
 - (1) Type and form of material
Iridium 192 sources which meet the requirements of special form radioactive material.
 - (2) Maximum quantity of material per package
120 curies

Page 2 - Certificate No. 9033 - Revision No. 5 - Docket No. 71-9033

6. The source assembly for use with this packaging is limited to Technical Operations, Inc. Model No. A424-9 as shown in Technical Operations, Inc. Drawing No. C42400, Sheet 2 of 3, Rev. F.
7. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under general license provisions of 10 CFR §71.12.
9. Expiration date: May 31, 1989.

REFERENCES

Technical Operations, Inc. application dated November 8, 1974.

Supplements dated: December 15, 1978; June 15, 1979; and April 17, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Original Signed by
CHARLES E. MACDONALD

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: May 11, 1984

**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
9034	5	USA/9034/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

GA Technologies, Inc.
P.O. Box 81608
San Diego, CA 92138

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Atomic Company application dated
December 26, 1974, as supplemented.

c. DOCKET NUMBER 71-9034

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.: TRIGA-1
- (2) Description

TRIGA fuel element shipping container. The outer packaging is fabricated to DOT Specification 6J requirements. The outer dimensions are approximately 22.5 inches in diameter by 36 inches high. The inner vessel is a 5-inch Schedule 40 carbon steel pipe. Dimensions of the inner vessel are approximately 31 inches in height with a 1/4-inch thick wall and a 5-inch inside diameter. The top of the inner vessel is a threaded pipe cap and the bottom is a welded 1/4-inch thick flat disc. The inner vessel is centered and supported within the outer packaging by eight, 3/8-inch diameter braced, support spacer rods. The void between the inner vessel and the outer packaging is filled with vermiculite tamped to a minimum density of 4.5 lbs/ft³. Maximum gross weight including contents is approximately 235 pounds.

Page 2 - Certificate No. 9034 - Revision No. 5 - Docket No. 71-9034

5. (a) Packaging (Continued)

(3) Drawing

The packaging is constructed in accordance with the following General Atomic Company Drawing No. TOS396C160, Rev. A.

(b) Contents

(1) Type and form of material

TRIGA fuel elements containing uranium-zirconium-hydride or erbium-uranium-zirconiumhydride and clad with stainless steel, aluminum, or Incoloy. The Zr to H atomic ratio within the fuel meat shall not exceed 1.65.

(2) Maximum quantity of material per package

1.95 kg U-235 contained within twenty-five (25) fuel elements.

(c) Fissile Class

II

Minimum transport index to be shown on label

2.7

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

7. Expiration date: February 28, 1985.

REFERENCES

General Atomic Company application dated December 26, 1974.

Supplement dated: February 7, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: _____

SEP 06 1983

**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
9035	5	USA/9035/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): | b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: |
|--|--|
| Technical Operation, Inc.
Northwest Industrial Park
Burlington, MA 01803 | Technical Operations, Inc. application dated
November 20, 1979. |

c. DOCKET NUMBER 71-9035

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 Nos.: 680 and 680E
- (2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consists of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and a Zircalloy "S" tube. The contents are securely positioned in the Zircalloy "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 405 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos.:

- 68090 Sheets 1, 2, 3, 4 and 5 of 5, Rev. C
6025 Sheets 2 and 3 of 3, Rev. A.

Page 2 - Certificate No. 9035 - Revision No. 5 - Docket No. 71-9035

5. (b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

110 curies

6. The source shall be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: January 31, 1985.

REFERENCE

Technical Operation, Inc. application dated November 20, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9036	4	USA/9036/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Source Production & Equipment Co.
625 Oxley Street
Kenner, LA 70062

Source Production & Equipment Company
application dated January 23, 1975, as
supplemented.

c. DOCKET NUMBER 71-9036

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.: C-1
- (2) Description

A uranium shielded radiographic source changer. Configuration is that of a rectangular box 9" high x 7.5" wide x 7" deep. All fittings and source locking components are protected and enclosed with a 1/8" carbon steel outer shell. The inner receptacle consists of a uranium shield equipped with two closed bottom Zircalloy "J" tubes, each of which may house one "pigtail type" special form source. Maximum gross weight is 45 lbs.

(3) Drawings

The package is constructed in accordance with the Source Protection & Equipment Company drawings as submitted in the application and supplement dated January 23, 1975 and May 7, 1975, respectively.

Page 2 - Certificate No. 9036 - Revision No. 4 - Docket No. 71-9036

5. (b) Contents

(i) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Two sealed sources with a combined activity not to exceed 240 curies.

- 6. The nameplate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: July 31, 1985.

REFERENCES

Source Production & Equipment Company application dated January 23, 1975.

Supplements dated: May 7, 1975; and February 16, 1984 (received).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonaid
 Charles E. MacDonaid, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: MAR 14 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9037	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/9037/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

GA Technologies, Inc.
P.O. Box 81608
San Diego, CA 92138

General Atomic Company application dated
December 26, 1974, as supplemented.

c. DOCKET NUMBER **71-9037**

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.: TRIGA-2

(2) Description

TRIGA fuel element shipping container. The outer packaging is fabricated to DOT Specification 6J requirements. The outer dimensions are approximately 22.5 inches in diameter by 55 inches high. The inner vessel is a 5-inch Schedule 40 carbon steel pipe. Dimensions of the inner vessel are approximately 50 inches in height with a 1/4-inch thick wall and a 5-inch inside diameter. The top of the inner vessel is a threaded pipe cap and the bottom is a welded 1/4-inch thick flat disc. The inner vessel is centered and supported within the outer packaging by eight, 3/8-inch diameter braced, support spacer rods. The void between the inner vessel and the outer packaging is filled with vermiculite tamped to a minimum density of 4.5 lbs/ft³. Maximum gross weight including contents is approximately 330 pounds.

(3) Drawing

The packaging is constructed in accordance with the following General Atomic Company Drawing No. TOS396C161, Rev. A.

Page 2 - Certificate No. 9037 - Revision No. 5 - Docket No. 71-9037

(b) Contents

(1) Type and form of material

TRIGA fuel elements containing uranium-zirconium-hydride or erbium-uranium-zirconiumhydride and clad with stainless steel, aluminum, or Incoloy. The Zr to H atomic ratio within the fuel meat shall not exceed 1.65.

(2) Maximum quantity of material per package

1.95 kg U-235 contained within twenty-five (25) fuel elements.

(c) Fissile Class

II

Minimum transport index to be shown on label

2.7

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

7. Expiration date: February 28, 1985.

REFERENCES

General Atomic Company application dated December 26, 1974.

Supplement dated: February 1, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9039	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/9039/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Technical Operations, Inc. Northwest Industrial Park Burlington, MA 01803	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Technical Operations, Inc. application dated April 11, 1980.
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c. DOCKET NUMBER **71-9039**

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.: 715
- (2) Description

A protective overpack for radiographic devices. The overpack consists of an MS-27683-2, 18-gauge steel drum; 14-gauge clamp closure ring fastened by a bolt; 1.5 inches of Mil-I-2781 or Mil-2819 high temperature insulation; and a molded rubberized hair filler material. Overall dimensions of the overpack are approximately 15.5-inch diameter by 24-inch high. Maximum weight including contents is 105 pounds.

(3) Drawings

The radiographic devices, as secondary packaging authorized for use in the overpack are constructed in accordance with the following Technical Operations, Inc. Drawing Nos.:

<u>Model No.</u>	<u>Drawing Nos.</u>
533	D53301, Rev. B
616	D61699, Rev. 0
644	D64400, Rev. I
713	C71301, Rev. 0
	D53301, Rev. B

Page 2 - Certificate No. 9039 - Revision No. 6 - Docket No. 71-9039

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

(i) 120 curies contained in the Model No. 533, Model No. 644 or Model No. 713 radiographic device.

(ii) 240 curies contained in the Model No. 616 radiographic device.

6. Source assemblies for use in this packaging are limited to those assemblies as identified in Technical Operations, Inc. Drawing No. C42400, Rev. F, Sheet 2, and Sheet 3 of 3.

7. Separate molded filters shall be used for each model type radiographic device to ensure a snug fit within the overpack.

8. Nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.

10. Expiration date: August 31, 1985.

REFERENCE

Technical Operations, Inc. application dated April 11, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9044	b. REVISION NUMBER 13	c. PACKAGE IDENTIFICATION NUMBER USA/9044/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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c. 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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): General Electric Company P.O. Box 460 Pleasanton, CA 94566	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: General Electric Company application dated February 1, 1982, as supplemented.
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c. DOCKET NUMBER **71-9044**

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.: GE-1600

(2) Description

Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pallet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The cavity is equipped with a drain line and the physical description is as follows:

Cask height, in	67.19
Cask diameter, in	38.5
Cavity height, in	54.0
Cavity diameter, in	26.5
Lead shielding, in	5.0
Protective jacket height, in	81.88
Protective jacket width, in	68.0
Packaging weight, lb	25,500

Page 2 - Certificate No. 9044 - Revision No. 13 - Docket No. 71-9044

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

129D4735, Rev. 3
129D4736, Rev. 3
129D4737, Rev. 4
129D4738, Rev. 1

Lifting and/or tie-down devices which are a structural part of the package must be in accordance with the above drawings.

(b) Contents

(1) Type, form and maximum quantity of material per package

Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements; and

- (i) Byproduct material and special nuclear material as solid metal or oxides. Decay heat not to exceed 600 watts. The radioactive material shall be in the form of fuel rods, or plates, fuel assemblies, or meeting the requirements of special form radioactive material.

500 gm U-235 equivalent mass; or

- (ii) Neutron sources meeting the requirements of special form radioactive material.

500 gm U-235 equivalent mass. Decay heat not to exceed 50 watts; or

- (iii) Irradiated PuO_2 and UO_2 fuel rods clad in Zircalloy or stainless steel. Decay heat not to exceed 600 watts. All fuel rods shall be contained within a closed 5-inch Schedule 40 pipe with a maximum useable length of 39-5/8 inches.

1,200 gm fissile material with no more than 300 gm fissile material per 5-inch Schedule 40 pipe.

- (iv) Irradiated UC and ThC fuel particles clad in graphite and contained within a standard HTGR hexagonal cross-section graphite block. Decay heat not to exceed 600 watts. Each graphite block shall be contained within a sealed cylindrical inner container constructed in accordance with General Atomic Company Drawing No. 021583, Issue A, with three, 1/2-inch by 4-1/2-inch radial fins to provide centering within the cavity.

1,400 grams U-235 equivalent mass in each inner container with no more than one inner container per package.

Page 3 - Certificate No. 9044 - Revision No. 13 - Docket No. 71-9044

5. (b) (1) Contents (continued)

(v) Process solids, either dewatered, solid, or solidified in a secondary sealed container meeting the requirements for low specific activity radioactive material.

(vi) Solid nonfissile irradiated metal hardware, reactor control rods (blades), reactor start-up sources, and segmented boron carbide tubes (tube contents not to exceed a Type A quantity).

(vii) Radioactive (Hot Cell) waste materials immobilized with cement grout and contained in a 55-gallon (or extended 55-gallon drum) DOT Specification 17H or 17C steel drum, lid and closure. The waste material must be packaged in accordance with the Procedural Outline of the Immobilization of Cell Waste Using Cement Grout, Attachment 1 of the December 1, 1981 supplement. The cement grout must be at least 50 volume percent (estimated) of the drum contents and relatively uniformly distributed throughout the drum. At least 3/4" thick layer of grout must cover all radioactive waste contents. Decay heat not to exceed 100 watts, and fissile material not to exceed 500 grams U-235 equivalent mass.

(c) Fissile Class III

Maximum number of packages per shipment

(i) Contents 5.(b)(1)(i), 5.(b)(1)(ii), 5.(b)(1)(iii), or 5.(b)(1)(vii):

Two (2); or

(ii) Contents 5.(b)(1)(iv):

One (1)

6. The U-235 equivalent mass is determined by U-235 mass plus 1.66 times U-233 mass plus 1.66 times Pu mass.
7. For packaging of neutron sources, the cavity drain line must be closed with a plug with a melting temperature of 200°F and the cask cavity must be dry before delivery of the package to a carrier.
8. For packaging of other than neutron sources, the cask must be delivered to a carrier dry and the cavity drain line must be closed with a plug which will maintain its seal at temperatures up to at least 620°F.
9. For the shipment of irradiated metal hardware, the use of the auxiliary shielded inner container and shoring plug shown in Chem-Nuclear Systems, Inc. Drawing Nos. 8651-E-02, Rev. A and 8651-C-01, Rev. A is authorized. The inner container must be provided with vent and drain lines.

Page 4 - Certificate No. 9044 - Revision No. 13 - Docket No. 71-9044

10. Shoring must be provided to minimize movement of contents during accident conditions of transport.
11. Prior to each shipment the silicone rubber lid gasket(s) must be inspected. This gasket(s) must be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line must be sealed with appropriate sealant applied to threads of pipe plug.
12. For packaging of neutron sources, 50 times the measured neutron dose rate at one meter from the surface of a cask must be less than 1,000 mrem/hr.
13. The contents described in 5(b)(1)(v) must be transported on a motor vehicle, railroad car, aircraft, inland water crafts, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
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: April 30, 1987.



REFERENCES

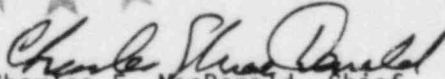
General Electric application dated February 1, 1982.

Supplements dated: March 30, 1982; and January 17 and February 4, 1983.

Nuclear Plant Services supplement dated: July 7, 1975.

Chem-Nuclear Systems, Inc. supplement dated: April 6, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 25 1984

**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
9045	3	USA/9045/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- b. This certificate does not relieve the signor 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
General Electric Company P.O. Box 460 Pleasanton, CA 94566	General Electric Company application dated April 21, 1980, as supplemented.
	c. DOCKET NUMBER 71-9045

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.: GE-1000
- (2) Description

Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pellet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The physical description is as follows:

Cask height, in	28.5
Cask diameter, in	21.75
Cavity height, in	9.5
Cavity diameter, in	1.75
Lead shielding, in	8.75
Protective jacket height, in	38.25
Protective jacket width, in	33.75
Packaging weight, lb	5,200

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

- 161F478, Rev. 2
- 106D3879, Rev. 2
- 161F479, Rev. 2
- 106D3880, Rev. 2

Page 2 - Certificate No. 9045 - Revision No. 3 - Docket No. 71-9045

5. (b) Contents

(1) Type and form of material

- (i) Byproduct material meeting the requirements of special form radioactive material; or
- (ii) Solid metal non-fissile irradiated metal hardware.

(2) Maximum quantity of material per package.

Radioactive decay heat not to exceed 250 watts.

6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.

7. Package contents shall be delivered to a carrier dry.

8. Prior to each shipment the silicone rubber lid gasket shall be inspected. The silicone rubber gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

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

10. Expiration date: July 31, 1985.

REFERENCES

General Electric Company application dated April 21, 1980.

Supplements dated: November 19 (Exhibit A), 1968; and February 20 and 27, 1969.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9046	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/9046/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): General Electric Company P.O. Box 460 Pleasanton, CA 94566	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: General Electric Company application dated April 22, 1980, as supplemented.
c. DOCKET NUMBER 71-9046	

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.: GE-1100
- (2) Description

Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pallet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The physical description is as follows:

Cask height, in	30.6
Cask diameter, in	24.0
Cavity height, in	7.75
Cavity diameter, in	4.25
Lead shielding, in	9.4
Protective jacket height, in	43.9
Protective jacket width, in	40.75
Packaging weight, lb	7,000

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

144F612, Rev. 3
106D3992, Rev. 1
277E416, Rev. 1
106D3991, Rev. 1

Page 2 - Certificate No. 9046 - Revision No. 3 - Docket No. 71 - 9046

5. (b) Contents

(1) Type and form of material

(i) Byproduct material meeting the requirements of special form radioactive material; or

(ii) Solid nonfissile irradiated metal hardware.

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 810 watts.

6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
7. Package contents shall be delivered to a carrier dry.
8. Prior to each shipment the silicone rubber lid gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: July 31, 1985.

REFERENCES

General Electric Company application dated April 22, 1980.

Supplements dated: February 20 and 27, 1969.

★ ★ ★ FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9049	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/9049/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): General Electric Company P.O. Box 460 Pleasanton, CA 94566	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: General Electric Company application dated February 21, 1980, as supplemented.
c. DOCKET NUMBER 71-9049	

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.: GE-500
- (2) Description

Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pallet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The cavity drain line is closed by either a stainless steel or fusible plug (melting point 500°F). The physical description is as follows:

Cask height, in	29.0
Cask diameter, in	28.0
Cavity height, in	7.0
Cavity diameter, in	7.0
Lead shielding, in	10.0
Protective jacket height, in	38.9
Protective jacket width, in	40.75
Packaging weight, lb	7,800

(3) Drawings:

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

- | | |
|-------------------|------------------|
| 212E246, Rev. 7 | 106D3855, Rev. 4 |
| 106D3870, Rev. 11 | 129D4690, Rev. 0 |
| 706E790, Rev. 4 | |

Page 2 - Certificate No. 9049 - Revision No. 4 - Docket No. 71-9049

5. (b) Contents

(1) Type and form of material

- (i) Byproduct material meeting the requirements of special form radioactive material; or
- (ii) Solid nonfissile irradiated metal hardware and reactor control rods (blades).

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 780 watts.

- 6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
- 7. Package contents shall be delivered to a carrier dry.
- 8. Prior to each shipment the silicone rubber lid gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.
- 9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 10. Expiration date: July 31, 1985.

REFERENCES

General Electric Company application dated February 21, 1980.

Supplement dated: August 26, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9050	3	USA/9050/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- b. This certificate does not relieve the consignee 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

General Electric Company application dated
April 18, 1980, as supplemented.

c. DOCKET NUMBER 71-9050

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.: GE-900
- (2) Description

Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pallet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The cavity drain line is closed by a stainless steel pipe plug. The physical description is as follows:

Cask height, in	22.6
Cask diameter, in	20.0
Cavity height, in	3.0
Cavity diameter, in	3.0
Lead shielding, in	8.0
Protective jacket height, in	26.9
Protective jacket width, in	32.0
Packaging weight, lb	3,750

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

277E418 (Sudd Co. No. 1-559, Mark D)
106D3976, Rev. 1
277E409, Rev. 2
106D3983, Rev. 1

Page 2 - Certificate No. 9050 - Revision No. 3 - Docket No. 9050

(b) Contents

(1) Type and form of material

(i) Byproduct material meeting the requirements of special form radioactive material; or

(ii) Solid non-fissile irradiated metal hardware.

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 400 watts.

6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
7. Package contents shall be delivered to a carrier dry.
8. Prior to each shipment the silicone rubber lid gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.12.
10. Expiration date: July 31, 1985.

REFERENCES

General Electric Company application dated April 18, 1980.

Supplements dated: February 20 and 27, 1969.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9051	3	USA/9051/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated
April 22, 1980, as supplemented.

c. DOCKET NUMBER 71-9051

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.: GE-1400

(2) Description

Steel encased lead shielded shipping cask. A double-walled steel cylinder protective jacket encloses the cask during transport. It is bolted to a steel pallet. The cask is closed by a lead-filled flanged plug fitted with a silicone rubber gasket and bolted closure. The cavity drain line is closed by a stainless steel pipe plug. The physical description is as follows:

Cask height, in	22.6
Cask diameter, in	20.0
Cavity height, in	4.0
Cavity diameter, in	2.5
Lead shielding, in	8.3
Protective jacket height, in	28.3
Protective jacket width, in	32.0
Packaging weight, lb	3,750

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

277E417 (Budd Co. No. 1-557, Mark B)
106D3981, Rev. 1
277E412, Rev. 2
106D3983, Rev. 1

Page 2 - Certificate No. 9051 - Revision No. 3 - Docket No. 71-9051

(b) Contents

(1) Type and form of material

(i) Byproduct material meeting the requirements of special form radioactive material; or

(ii) Solid non-fissile irradiated metal hardware.

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 540 watts.

6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.
7. Package contents shall be delivered to a carrier dry.
8. Prior to each shipment the silicone rubber lid gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: July 31, 1985.

The seal of the U.S. Nuclear Regulatory Commission is centered on the page. It features an eagle with wings spread, perched on a shield with vertical stripes. The shield is flanked by olive branches and arrows. The words "U.S. NUCLEAR REGULATORY COMMISSION" are written in a circular path around the eagle. Below the eagle are five stars.
REFERENCES

General Electric Company application dated April 22, 1980.

Supplements dated: February 20 and 27, 1969.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9053	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/9053/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803

Technical Operations, Inc. application dated
June 16, 1980.

c. DOCKET NUMBER **71-9053**

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.: 683

(2) Description

A radiographic exposure device contained within a protective overpack. The overpack is an 18-gauge, MS27683 steel drum with a bolted and seal wire clamp closure ring. The drum is filled with molded rubberized hair to maintain a snug fit. Overall dimensions are 19.5" diameter x 15" high. The radiographic exposure device consists of an 11-gauge carbon steel shell, depleted uranium shielding, Zircalloy "S" tube, polyurethane filler material, source shipping plug and lock assembly. Gross weight of the package is approximately 89 lbs.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos.: C68302; C68302-1, 3, 4; C68303; B68303-1, Sh. 2; B68302-9, B68307-1; A68307; A68308-1C; A86302-8; A68311; A68309-9.

Page 2 - Certificate No. 9053 - Revision No. 3 - Docket No. 71-9053

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. Source assemblies for use in this packaging are limited to those assemblies as identified in Technical Operations, Inc. Drawing Nos. A68309, and C68310.

Nameplate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

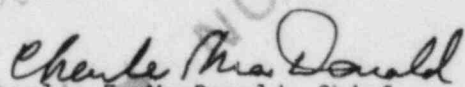
The packaging authorized by this certificate is hereby approved for use under the general provisions of 10 CFR §71.12.

Expiration date: July 31, 1985.

REFERENCE

Technical Operations, Inc. application dated June 16, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Dated: SEP 06 1983

**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
9056	2	USA/9056/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Source Production & Equipment Company 625 Oxley Street Kenner, LA 70062	Source Production & Equipment Company application dated July 28, 1975, as supplemented.
c. DOCKET NUMBER 71-9056	

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.: SPEC 2-T
- (2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, depleted uranium shield, and a Zircalloy "S" tube. The contents are securely positioned in the Zircalloy "S" tube by a source cable locking device and shipping plug. The unit resembles a rectangular box 12.5" long by 4.4" high by 4.4" wide with a gross weight of 40 pounds.

(3) Drawing

The packaging is constructed in accordance with Source Production & Equipment Company Drawing No. 1000, Revision No. 0.

5. (b) Contents

- (1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

Page 2 - Certificate No. 9056 - Revision No. 2 - Docket No. 71-9056

5. (b) Contents (continued)

(2) Maximum quantity of material per package
200 curies

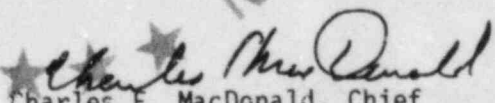
6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug and source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly ball stop must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The nameplates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: March 31, 1986.

REFERENCES

Source Production & Equipment Company application dated July 28, 1975.

Supplement dated: January 8, 1976.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9057	4	USA/9057/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
GA Technologies, Inc. P.O. Box 81608 San Diego, CA 92136	GA Energy & Environmental Systems application dated August 3, 1973.

c. DOCKET NUMBER 71-9057

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.: FPD-100
- (2) Description

New, reconditioned or raw 55-gallon steel drum, free of observable defects, with minimum thickness 18-gauge body sheet, 18-gauge bottom head sheet and 18-gauge removable head sheet with one or more corrugations in the cover near the periphery. The outer drum closure shall be accomplished by at least a 12-gauge bolt-locking ring with drop-forged lugs, one of which is threaded to receive at least 5/8-inch diameter bolt and lock nut. Gross weight not to exceed 260 pounds.

(b) Contents

- (1) Type and form of material

Solid uranium bearing materials. Uranium may be enriched to any degree in the U-235 isotope.

Page 2 - Certificate No. 9057 - Revision No. 4 - Docket No. 71-9057

5. (b) Contents (continued)

(2) Maximum quantity of material per package

Total contents not to exceed 200 pounds, 350 grams U-235 and Type A quantities of radioactive materials.

(c) Fissile Class

III

Maximum number of packages per shipment 50

6. Special nuclear material shall be contained in secondary plastic bottles or jars, metal cans or jars or heavy plastic bags securely tied closed within the steel drum. Metal secondary containers must be capable of venting to avoid rupture of the package in the event the package is exposed to the thermal test, 10 CFR §71.73(c)(3).
7. Fissile Class III shipments are restricted to shipments between the licensee's Sorrento Valley Fuel Manufacturing Facility and other on-site facilities.
8. Expiration date: October 31, 1985.

REFERENCE

Gulf Energy & Environmental Systems application dated August 3, 1973.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle
 and Material Safety, NMSS

Date: _____

SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9067	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9067/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Battelle Columbus Laboratories 505 King Avenue Columbus, OH 43201	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Battelle Columbus Laboratories application dated August 7, 1981
c. DOCKET NUMBER 71-9067	

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.: BCL-3
- (2) Description

Steel encased lead shielded shipping package. The packaging is provided with recessed plug-type lid and gasketed, bolted closure, lifting and tie-down devices and a drain line penetration. Containment for the contents is provided by an inner can assembly or by material in special form. The packaging dimensions, weight, and shielding as follows:

Exterior height, in	26.4
Exterior diameter, in	19.0
Cavity height, in	10.5
Cavity diameter, in	4.5
Lead shielding, in	6.0
Loaded weight, lb	2,800 (Incl 110-1b skid)

(3) Drawing

The packaging is contracted in accordance with Battelle Memorial Institute Drawing No. BCL3-01, Sheets 1 & 2, Rev. C.

Page 2 - Certificate No. 9067 - Revision No. 2 - Docket No. 71-9067

5. (b) Contents

Type and form and maximum quantity of material per package.

Byproduct material, source material and special nuclear material not to exceed 300 watts decay heat in solid metal or oxide form packaged within an inner can assembly or the material meets the requirements of special form radioactive material and limitations on fissile loading for the Fissile Class as follows:

Inner can assembly:

Battelle Memorial Institute Drawing No. BCL3-38, Rev. B.

Fissile Class I 100*

Fissile Class III 2000*

* (grams U-235 equivalent mass)

(c) Fissile Class I and III

Maximum number of packages per shipment for Class III One (1)

6. The U-235 equivalent mass must be determined by the following method:

U-235 equivalent mass equals U-235 mass plus 1.75 times U-233 mass plus 1.60 times Pu mass.

7. At the time of delivery of the loaded package to a carrier for transport, the package contents must be (1) dry (contents of inner can assembly must not decompose up to a temperature of 750°F) and the fissile material unmoderated (H to X atomic ratio less than 2) and (2) so limited that the dose rate will not exceed 10 millirem per hour at three (3) feet from the external surface of the package.

8. The maximum gross weight of the cavity contents must not exceed 40 pounds (inner can assembly, radioactive material, etc.).

Page 3 - Certificate No. 9067 - Revision No. 2 - Docket No. 71-9067

9. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet all of the acceptance and periodic tests specified in Section 8.0 of the Application.

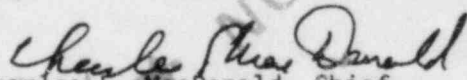
The following item in the thermal acceptance tests (8.1.6) is changed as follows:

- (4, The acceptance criteria must be that the maximum measured temperature of any portion of the cask must not exceed the temperatures indicated in Figure 3.3 of this application by more than 5°F (300 watt maximum heat load). In this comparison, solar heating and ambient temperature differences between Figure 3.3 and the test data must be taken into account.
10. The following item in the Test Procedure (8.1.3.2), Section 8.0 of the Application, is changed as follows:
- g. Remove pressurization line and insert plug in pressure port according to the loading procedure. Use teflon tape or other compatible sealant in threads.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: September 30, 1986.

REFERENCE

Battelle Columbus Laboratories application dated August 7, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9068	2	USA/9068/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Battelle Columbus Laboratories
505 King Avenue
Columbus, OH 43201

Battelle Columbus Laboratories application
dated August 21, 1981.

c. DOCKET NUMBER 71-9068

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.: BCL-2

(2) Description

Steel encased lead shielded shipping package. The packaging is provided with recessed plug-type lid and gasketed, bolted closure, lifting and tie-down devices and a drain line penetration. Containment for the contents is provided by an inner can assembly or by material in special form. The packaging has dimensions, weight, and shielding as follows:

Exterior height, in	18.2
Exterior diameter, in	15.5
Cavity height, in	5.25
Cavity diameter, in	4.5
Lead shielding, in	4.5
Loaded weight, lb	1,360 (incl 110-lb skid)

(3) Drawing

The packaging is constructed in accordance with Battelle Memorial Institute Drawing No. BCL2-01, Sheets 1 and 2, Rev. D.

Page 2 - Certificate No. 9068 - Revision No. 2 - Docket No. 71-9068

5. (b) Contents

Type and form and maximum quantity of material per package.

Byproduct material, source material and special nuclear material not to exceed 200 watts decay heat in solid metal or oxide form packaged within an inner can assembly or the material meets the requirements of special form radioactive material and limitations on fissile loading for the Fissile Class as follows:

Inner can assembly:

Battelle Memorial Institute Drawing No. BCL2-47, Rev. B.

Fissile Class I 50*

Fissile Class III 2,000*

* (grams U-235 equivalent mass)

(c) Fissile Class I and III

Maximum number of packages per shipment for Class III One (1)

6. The U-235 equivalent mass must be determined by the following method:

U-235 equivalent mass equals U-235 mass plus 1.75 times U-233 mass plus 1.60 times Pu mass.

7. At the time of delivery of the loaded package to a carrier for transport, the package contents must be (1) dry (contents of inner can assembly must not decompose up to a temperature of 750°F) and the fissile material unmoderated (H to X atomic ratio less than 2) and (2) so limited that the dose rate will not exceed 10 millirem per hour at one meter from the external surface of the package.

8. The maximum gross weight of the cavity contents must not exceed 20 pounds (inner can assembly, radioactive material, etc.).

Page 3 - Certificate No. 9068 - Revision No. 2 - Docket No. 71-9068

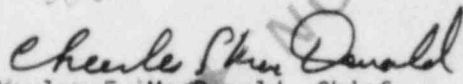
9. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet all of the acceptance and periodic tests specified in Section 8.0 of this Application.

The following item in the Thermal Acceptance Tests (8.1.6) is changed as follows:

- (4) The acceptance criteria must be that the maximum measured temperature of any portion of the cask must not exceed the temperatures indicated in Figure 3 of this application. In this comparison, solar heating and ambient temperature differences between Figure 3 and the test data must be taken into account.
10. The following item in the Test Procedure (8.1.3.2), Section 8.0 of the Application, is changed as follows:
- g. Remove pressurization line and insert plug in pressure port according to the loading procedure. Use teflon tape or other compatible sealant in threads.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: September 30, 1986.

Battelle Columbus Laboratories application for approval of Container No. BCL-2, dated August 21, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9069	7	USA/9069/B()F	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation application
dated October 30, 1981, as supplemented.

c. DOCKET NUMBER

71-9069

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.: MO-1

(2) Description

Steel overpack consisting of a 12 gauge outer shell (45" x 47" x 206") and a 10 gauge inner shell (max. 37" x 37" x 186"). The volume between the shells is filled with a shock-and-thermal-insulating material consisting of rigid polyurethane foam. The upper and lower sections of the overpack are secured by 12 ratchet binders and 12 high strength 5/8" latch pins. The fuel assemblies are held in place within the overpack by a strongback and adjustable clamping assembly (shock mounted). Neutron absorber plates are located between the fuel assemblies. The package is equipped with lifting, tie-down and pressure relief devices. Gross weight of the package is 8,600 pounds.

(3) Drawing

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. 1581F50, Sheets 1 and 2, Rev. 1. Fuel rod container is constructed in accordance with Westinghouse Electric Corporation Drawing No. C5650D55, Rev. 7.

Page 2 - Certificate No. 9069 - Revision No. 7 - Docket No. 71-9069

5. (b) Contents

(1) Type and form and maximum quantity of material per package.

(i) Unirradiated UO_2 - PuO_2 PWR fuel assembly with the following maximum active dimensions and maximum compositions:

Cladding material	Zr
Envelope, in	7.784 x 7.784
Enrichment	
PuO_2 in PuO_2 plus UO_2 , w/o	*(a)
PuO_2 fissile in PuO_2 , w/o	*(b)
UO_2 fissile in UO_2 , w/o	0.71
Fissile, kg	16.6
Fuel length, in	144
Decay heat load, watts/pkg	400

*For three plutonium isotopic cases:

Case 1,

the PuO_2 enrichment (a) is 6.0 w/o; fissile PuO_2 (b) is 71 w/o.

Case 2,

the PuO_2 enrichment (a) is 4.4 w/o; fissile PuO_2 (b) is 81 w/o.

Case 3,

the PuO_2 enrichment (a) is 3.03 w/o; fissile PuO_2 (b) is 85 w/o.(ii) Mixed PuO_2 in natural UO_2 as pressed sintered pellets fully clad in leak-tight Zircalloy of minimum 0.024" thickness as fuel rods of the following specifications:

Type	
Pellet diameter (nom), in	0.365
Rod diameter (nom), in	0.422
Fuel length (nom), in	120 to 144
PuO_2 in PuO_2 plus UO_2 , w/o	6.0
PuO_2 fissile in PuO_2 , w/o	85
UO_2 fissile in UO_2 , w/o	0.71

(iii) Uranium dioxide as stainless steel or aluminum clad unirradiated rods of the following specifications:

	SST Clad	AL Clad
Pellet diameter (max), in	0.446	0.406
Rod diameter (nom), in	0.476	0.475
Fuel length (max), in	70.0	61.0
^{235}U enrichment (max), w/o	4.02	2.5

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5. (b) (2) Maximum quantity of material per package.
- (i) For the contents described in 5(b)(1)(i)
Two fuel assemblies.
 - (ii) For the content described in 5(b)(1)(ii)
Not more than 94 kilograms Pu contained within the fuel rod container described in 5(a)(3).
 - (iii) For the contents described in 5(b)(1)(iii)
Two inner containers as described in 5(a)(3) containing not more than a total of 70 kilograms U-235.
- (c) Fissile Class II and III
- (1) Minimum transport index to be shown on label for Class II 1.6
 - (2) Maximum number of packages per shipment for Class III 62
6. Two (2) neutron absorber plates consisting of 0.19" thick, full length, stainless steel containing 1.3 percent minimum boron or 0.19" thick OFHC copper must be installed between the active area of the fuel assemblies.
7. Fuel rods must be closely packed in the fuel rod container on no more than an equivalent metal-to-metal square lattice. Partially loaded fuel rod containers must be fitted with a minimum of three, equally spaced blocks, of which the noncombustible portion of the blocks and the method by which they are secured must assure that the rods are maintained on no more than an equivalent metal-to-metal square lattice within the fuel rod container.
8. Each fuel assembly must be unsheathed or must be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath must not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

Page 4 - Certificate No. 9069 - Revision No. 7 - Docket No. 71-9069

Alternatively, the fuel assembly may be enclosed in an elongated plastic bag or sheath along its full length. At the bottom end of the fuel assembly, the bag will be cut off or folded back to assure that the entire cross section of the lower end of the assembly is unobstructed. When the folding is used, the portion of the sheath that is folded back will be cinched with tape near its end to hold it in place, and the length will be such that when the assembly is loaded in the packaging, the folded sheath will be clamped in place in at least two grid locations. The top end of the bag may be gathered together and taped closed. However, the top end then will be slit on all four sides. The slits will run perpendicular to the axis of the assembly and will extend the inner distance between the top nozzle pads and spring clamps (approximately 60 percent of the length of each side). The slits will be made in a plane near that formed by the top of the pads and clamps.


9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: November 30, 1986.

REFERENCES

Westinghouse Electric Corporation application dated October 30, 1981.

Department of Energy supplements dated: April 2 and June 14, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 27 1984

**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
9070	10	USA/9070/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Incorporated
application dated April 23, 1982.

c. DOCKET NUMBER

71-9070

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.: N-55

(2) Description

A low carbon steel overpack filled with rigid polyurethane foam. The containment vessel is a 55-gallon drum, meeting the requirements of DOT Specification 17H or 17C. The overpack is a right circular cylinder 48 inches high by 32 inches diameter with a 34-1/2-inch high by 24-inch diameter cavity. The 20-gauge galvanized steel shell is filled with 3-pound per cubic foot rigid polyurethane foam. Closure of the upper and lower (lid and body) sections of the overpack is provided by four toggle clamps, and a Neoprene gasket at the stepped joint between the two sections. Four lugs are provided for lifting and tie-down. The package gross weight is approximately 750 pounds.

(3) Drawing

The packaging is constructed in accordance with Nuclear Packaging, Incorporated Drawing No. X-60-200D, Rev. C.

Page 2 - Certificate No. 9070 - Revision No. 10 - Docket No. 71-9070

(b) Contents

(1) Type and form of material

- (i) Radioactive material including fissile material in the form of dry solids contained in DOT Specification 17H or 17C steel drums. Liquids, powders and slurries are not permitted.
- (ii) Tritium absorbed on metal backing as titanium tritide held within the container assembly shown in Lawrence Livermore Laboratory Drawing No. AAA-77-109723, Rev. C.
- (iii) Dry, solid forms of plutonium and uranium.

(2) Maximum quantity of material per package

- (i) For the contents described in 5(b)(1)(i) greater than Type A quantity radioactive material. Fissile material contents not to exceed the generally licensed mass limits as specified in 10 CFR §§71.18 and 71.22 and plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor fuel elements. Internal decay heat not to exceed 3 watts.
- (ii) For the contents described in 5(b)(1)(ii) a maximum of six (6) container assemblies held within a DOT Specification 17H steel drum. Maximum activity not to exceed 30,000 curies per package. Internal decay heat not to exceed 1.08 watts per package.
- (iii) For the contents described in 5(b)(1)(iii), 200 grams plutonium plus fissile uranium provided the total plutonium content does not exceed 200 grams, with a heat generation rate of 5 watts. The radioactive material must be packaged within sealed metal cans or DOT Specification 2R containers and placed within inner containers constructed as specified in Appendix 1.10.4.1, 1.10.4.2, and 1.10.4.3 of the application. Prior to each shipment, a helium leak test must be performed on both the inner and outer containment assemblies capable of detecting a leak no greater than 10^{-7} atm cc/sec at standard temperature and pressure. Following the gas leak testing, all inner container welds must be leak tested using a liquid penetrant method in accordance with Article 6, Section V, ASME Code. No package with a detectable leak shall be delivered to a carrier for transport.

(3) Fissile Class

II

Minimum transport index to be shown on label

For the contents described in 5(b)(1)(iii):

Five (5)

Page 3 - Certificate No. 9070 - Revision No. 10 - Docket No. 71-9070

6. The maximum weight of contents including drum not to exceed 550 pounds.
7. The drum must be securely positioned in the overpack.
8. Contents must be securely positioned so that protrusions will not puncture the drum under normal or accident conditions.
9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: May 31, 1987.

REFERENCE

Nuclear Packaging, Incorporated Safety Analysis Report dated April 23, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: DEC 1 1983

**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
9071	2	USA/9071/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
ANEFco, Incorporated 222 Mamaroneck Ave. White Plains, NY 10605	ANEFco application received June 14, 1976, with report, "Safety Analysis Report Cask AP-101"

c. DOCKET NUMBER 71-9071

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.: AP-101
- (2) Description

A steel encased, lead shielded cask for non-fissile radioactive material. The overall dimensions of the cask are 40 inches in diameter by 193 inches long. The cask consists of two concentric stainless steel cylindrical shells. The inner shell is 5/8-inch thick by 28-inch ID; the outer stainless steel shell is 1-1/2-inch thick by 39-1/4-inch OD and a 3-1/2-inch poured lead shield fills the space between. The outer shell is surrounded by a 0.140-inch thick stainless steel thermal shield separated by a 0.125-inch thick stainless steel spacer wire. The cavity is 28 inches in diameter by 167 inches long. The base is a welded stainless steel construction with 3 inches of poured lead. The flanged lid is of stainless steel and lead. Closure is provided by twenty, 1-1/2-inch diameter bolts and a GASK-O-SEAL, closure seal. There are two penetrations into the containment vessel for drain lines which are plugged and gasketed with a neoprene seal. The cask is equipped with removable, canned balsa impact limiters at each end. The overall dimensions of the cask with impact limiters in place are 84 inches in diameter by 236 inches long. The cask has four lifting trunnions, two redundant pairs for lifting. Three of the trunnions are used for tie-down of the cask for shipment. The package gross weight is approximately 62,000 pounds.

Page 2 - Certificate No. 9071 - Revision No. 2 - Docket No. 71-9071

5. (a) Packaging (Continued)

(3) Drawings

The packaging is fabricated in accordance with ANEFCO, Incorporated Drawing Nos. SC-101, Rev. A; SC-102; SC-103, Rev. A; SC-104, Rev. B; SC-107, Rev. A; SC-108; SC-110, Rev. A; and SC-111.

(b) Contents

(1) Type and form of material

Greater than Type A quantity of byproduct material in the form of dry, solid, metallic waste material and activated reactor components.

(2) Maximum quantity of material per package

Weight of contents not to exceed 10,000 pounds. Internal decay heat of contents not to exceed 300 watts.

6. The package must be shipped dry. In preparation for shipment, the cask cavity must be drained of all excess water. A vacuum pump must be used to reduce the cavity pressure below the vapor pressure corresponding to the measured temperature of the drained water. The cavity pressure must be held below the vapor pressure determined for at least 90 minutes.
7. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet all of the acceptance and periodic tests specified in Sections 5.2 and 5.3 of the Application.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: November 30, 1986.

REFERENCES

ANEFCO, Incorporated Safety Analysis Report Cask AP-101, received June 14, 1976.

Supplements dated: July 21, August 6, and October 21, 1976.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9073	7	USA/9073/B()	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Packaging, Incorporated
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Incorporated, application dated
October 20, 1982, as supplemented.

c. DOCKET NUMBER

71-9073

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 Nos.: OH-142, OH-142 MKI, OH-142 MKIB, OH-142 MKII, and
NUS 10-135

(2) Description

Steel encased, lead shielded casks for solid radioactive material. The overall dimensions of the casks are 101-inch diameter by 120-inch height. The casks consists of two concentric carbon steel cylindrical shells surrounding a 3-1/2-inch thick lead shield. The 1/2-inch thick inner shell has a 66-inch ID, and the 1- or 1-1/8-inch thick outer shell has a 76-1/4-inch OD; the base consists of two, 3-inch thick welded steel plates of 66- and 74-inch diameters. The base is either welded to the steel cylindrical shells or sealed and held by ratchet binders. A stepped welded lid, secured by eight ratchet binders or eight studs and nuts, is comprised of two, 3-inch thick steel plates containing openings for secondary lids of similar construction with at least one additional 1-inch thick upper plate. The containment cavity is 66 inches in diameter by 72 inches high. A plugged drain port is located at the cask bottom. The Model No. NUS 10-135 package design is provided with a lid test port in lieu of a cask drain line. Toroidal impact limiters are located at the top and bottom of the cask. The impact limiters are 10-gauge steel sheets filled with rigid polyurethane, and are equipped with fusible plastic plugs. As an option, interior and exterior surfaces of the cask body and interior surfaces of the upper lid may be covered with 12-gauge 304 stainless steel cladding and seal welded.

There are four alternate lid closure designs for the Model No. OH-142 Series casks. The designs are referred to as: 1) Baseline design, 2) Mark 1, 3) Mark 1 with bolt on lid, and 4) Mark 2.

Page 2 - Certificate No. 9073 - Revision No. 7 - Docket No. 71-9073

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

Baseline closure design. Closure of the primary lid is accomplished by eight ratchet binders; and of the 24-inch (29-inch) secondary lid by eight, 7/8-inch (1-inch) diameter stud bolts. Both lids are sealed using silicone gaskets bonded to the lid plates. Lifting is facilitated with three lugs welded to the primary lid. The secondary lid has a redundant Neoprene seal, and a centrally located lift lug.

Mark 1 closure design. Closure of the primary lid is accomplished by eight ratchet binders, and a bonded silicone gasket provides the primary seal. Lifting is facilitated with three lugs welded to the primary lid. Six, 19-inch diameter secondary lids with centers located on a 44-inch circle each have six, 3/4-inch diameter hex head bolts. They each have a primary bonded silicone seal, a redundant Neoprene seal, and a centrally located lift lug.

An alternate Mark 1 configuration utilizes eight, 1-3/8-inch studs and nuts for primary lid closure and two lifting lugs on the primary lid.

Mark 2 closure design. Closure of the primary lids located at the top and bottom of the cask is accomplished by eight ratchet binders, and a bonded silicone gasket on each primary lid provides a seal. Lifting is facilitated with three lugs welded to the upper primary lid. The upper lid contains a centrally located 24-inch (or 29-inch) diameter secondary lid comprised of two stepped and welded 3-inch steel plates above and below a 1-inch steel plate. Closure of the secondary lid is provided by eight, 7/8-inch (or 1-inch) diameter stud bolts. The secondary lid has a bonded silicone seal, a redundant Neoprene seal and three lift lugs.

The Model No. NUS 10-135 cask is nearly identical to the baseline Model No. OH-142 cask with a 29-inch diameter secondary lid.

All exposed side walls are coated with an intumescent material or covered with a stainless steel thermal barrier. Four skewed lugs, welded to the outer shell are used for tie-down. The package gross weight is approximately 64,000 pounds.

(3) Drawings

The Model No. OH-142 Series packagings are fabricated in accordance with Nuclear Packaging, Incorporated Drawing Nos.: OH-142 - Y-20-201D, Sheets 1 and 2, Rev. J; OH-142 MKI - AL-20-202, Sheets 1 and 2, Rev. C; OH-142 MKIB - AL-20-203, Sheets 1 and 2, Rev. D; and OH-142 MKII - Y-20-202D, Sheets 1 and 2, Rev. F.

The Model No. NUS 10-135 packaging is fabricated in accordance with NUS Corporation Drawing No. 5025-M-2001, Sheets 1 and 2, Rev. A.

Page 3 - Certificate No. 9073 - Revision No. 7 - Docket No. 71-9073

(b) Contents

(1) Type and form of material.

Radioactive material including fissile material in the form of dry, solid, waste material and activated reactor components.

(2) Maximum quantity of material per package.

Internal decay heat not to exceed 400 watts, and the maximum weight of contents including secondary containers not to exceed 10,000 pounds. Fissile contents not to exceed the generally licensed mass limits as specified in 10 CFR §§71.18, 71.20, and 71.22.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, dunnage must be provided in the shipping cask cavity sufficient to prevent significant movement of the contents or secondary containers relative to the outer packaging under accident conditions.
8. Prior to each shipment, the lid gaskets must be inspected. These gaskets must be replaced if inspection shows any defects or every four (4) months, whichever occurs first.
9. The Model No. NUS 10-135 package must be leak tested in accordance with NUS Process Services Procedure WM-023, Rev. A, prior to each shipment. For packages containing only low specific activity material transported by exclusive use vehicle, the leak test need only be conducted quarterly and when repairs are made to the seal area.

Page 4 - Certificate No. 9073 - Revision No. 7 - Docket No. 71-9073

10. Packagings fabricated after March 28, 1980 must be constructed of A-516 Grade 70 carbon steel.
11. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: March 31, 1988.

REFERENCES

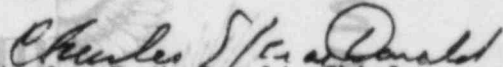
Nuclear Packaging, Incorporated application dated October 20, 1982.

Supplements dated: February 16, 1983; and March 5, April 4, and May 10, 1984.

Section 8, pp 8-1 through 8-14, regarding Quality Assurance are not considered part of this application.

NUS Process Services supplement dated: July 31, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, M55

Date: AUG 30 1984

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
9074	4	USA/9074/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

ANEFECO, Incorporated
P.O. Box 433
Ridgefield, CT 06877

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

ANEFECO, Inc. application dated January 31, 1983,
as supplemented.

c. DOCKET NUMBER

71-9074

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.: AP-100

(2) Description

A steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 92-1/4 inches height by 64 inches in diameter. The cask cavity is 87 inches deep by 60 inches diameter. The cask consists of two, 3/8-inch thick cylindrical steel shells surrounding a 1-1/4-inch thick lead shield. The base consists of two, 3/8-inch thick circular steel plates separated by a 1-1/4-inch lead shield, and welded to the cylindrical walls using full penetration welds. The cask cover is a welded circular steel construction surrounding a 1/2-inch lead shield. The cover is secured to the cask body using 32, 3/4-inch diameter bolts which feed through the cover to a steel bolt ring which is welded to the cask body.

The cask closure is sealed by two ethylene propylene gaskets. Four symmetrically spaced lugs are welded to the cask body for lifting and tie-down. Three removable, threaded eyes are attached to the cover for lifting. The package gross weight is approximately 28,000 pounds.

(3) Drawings

The packaging is fabricated in accordance with ANEFECO Drawing Nos. 00054-A, Rev A.; 00054-B; and 00054-C, Rev. D.

Page 2 - Certificate No. 9074 - Revision No. 4 - Docket No. 71-9074

5. (b) Contents

(1) Type and form of material

Solids and solidified waste which meet the requirements for low specific activity material. Solidified waste must be packaged in secondary inner containers within the cask

(2) Maximum quantity of material per package

Greater than type A quantity of radioactive material with the weight of contents and secondary containers not to exceed 10,000 pounds

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

- 7. The cover lifting eyes must not be used to lift the cask, and shall be removed prior to shipment.
- 8. Prior to each shipment, the packaging lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.
- 9. Fabrication of additional packaging after March 31, 1983 must be constructed of ASTM A-516, Grade 70 normalized fine grain practice steel in lieu of ASTM A-36 steel.

Page 3 - Certificate No. 9074 - Revision No. 4 - Docket No. 71-9074

10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: March 31, 1988.

REFERENCES

ANEFCA, Incorporated application dated January 31, 1983.

Supplement dated: October 14, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegarden

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9079	b. REVISION NUMBER 12	c. PACKAGE IDENTIFICATION NUMBER USA/9079/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address) Nuclear Packaging, Incorporated 1010 South 336th Street Federal Way, WA 98003	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION Nuclear Packaging, Incorporated, application Dated November 29, 1982, as supplemented.
c. DOCKET NUMBER 71-9079	

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 Nos.: NUPAC 14D-2.0, HN-100 Series 2 and HN-100 Series 2A
- (2) Description

Steel encased, lead shielded casks for low specific activity material. The casks are right circular cylinders 81-1/2 inches high by 81-3/4 inches in diameter. The cask cavities are 73-3/8 inches high by 75-1/2 inches in diameter. The cask side walls consists of a 3/8-inch thick inner steel shell, a 1-3/4-inch lead shell, and a 7/8-inch thick outer steel shell. Each base is comprised of two, 2-inch thick steel plates welded together to form a 4-inch thick base which is integrally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is comprised of two, 2-inch thick steel plates, which are stepped and welded together to mate with the steel flange. The cask closures are sealed by a Neoprene gasket located between the lid and steel flange, positive closure of the lid is accomplished by eight ratchet binders. The lid contains a centrally located shield plug comprised of two, 2-inch thick steel plates and one, 1-inch thick steel plate stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nuts are used to provide positive closure.

Tie-down is accomplished by four tie-down lugs welded to the cask body. There are four cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 48,000 pounds.

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5. (a) (3) Drawings

The Model No. NUPAC 14D-2.0 packaging is fabricated in accordance with Nuclear Packaging, Incorporated Drawing No. X-20-215D, Revision B; or

The Model Nos. HN-100 Series 2 and HN-100 Series 2A packaging is fabricated in accordance with Hittman Nuclear & Development Corp. Drawing Nos.: C001-5-9122, Rev. 5; C001-5-9123, Rev. 3; and C001-5-9124, Rev. 3. The Model No. HN-100 Series 2 is constructed of A-36 carbon steel. The Model No. HN-100 Series 2A is constructed of A-516, Grade 70, carbon steel.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents and secondary containers shall not exceed 14,000 pounds and the internal decay heat load shall not exceed 7 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

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7. Except for close fitting contents shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.
8. The lid and shield plug lifting lugs must not be used for lifting the cask, and shall be covered in transit.
9. In addition to the requirements of Subpart G of 10 CFR Part 71:
 - (i) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line and optional vent/test connection must be sealed with appropriate sealant applied to the pipe plug threads.
 - (ii) Each cask must meet the Acceptance Tests and Maintenance Program of Section 4.0 of the application. In addition, the cask must be leak tested at least once every twelve (12) months in accordance with Appendix 4.3.2 of the application or Westinghouse Hittman procedure STD-P-02-002, Rev. 0.
10. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).
11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
13. Expiration date: April 30, 1988.

REFERENCES

Nuclear Packaging, Incorporated application dated November 29, 1982.

Supplements dated: March 3 and April 8, 1983.

Westinghouse Hittman Nuclear Inc. supplement dated: June 8, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. H. Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**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
9080	10	USA/9080/A	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Westinghouse Hittman Nuclear
Incorporated
9151 Rumsey Road
Columbia, MD 21045

Westinghouse Hittman Nuclear Incorporated
application dated February 27, 1984, as supplemented.

c. DOCKET NUMBER

71-9080

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 Nos.: HN-600, NUPAC 100, and CNS 7-100

(2) Description

Steel encased, lead shielded casks for low specific activity material. The casks are right circular cylinders 54-1/2 inches high by 84 inches in diameter. Each cask has a cavity which is 40-1/4 or 40-3/4 inches high by 75-1/2 inches in diameter. The cask side wall consists of a 3/8-inch thick inner steel shell, a 3-inch lead shell, and a 3/4-inch thick outer steel shell. The base is comprised of two steel plates welded together to form a 5-1/2-inch thick base which is integrally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer shells of the side wall at the top. The 5-1/2-inch thick lid is comprised of two steel plates welded together, which are stepped to mate with the steel flange. The cask closure is sealed by a Neoprene gasket located between the lid and steel flange. Positive closure is accomplished by eight ratchet binders. The lid contains a 6-1/2-inch thick centrally located shield plug, comprised of three steel plates stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nuts or bolts are used to provide positive closure. A vent/test port in the shield plug and a stainless steel cavity sleeve is optionally provided.

Tie-down is accomplished by four tie-down lugs welded to each cask body. Each cask is provided with four lifting lugs, three lid lifting lugs, and one or three shield plug lifting lugs. The cask gross weight is approximately 48,000 pounds.

5. (a) (3) Drawings

The Model No. HN-600 packaging is fabricated in accordance with Hittman Nuclear & Development Corporation Drawing Nos.: C001-4-9600, Sheet 1, Rev. F; C001-4-9601, Sheets 1 and 2, Rev. E; C001-4-9602, Sheets 1 and 2, Rev. D; C001-4-9603, Sheet 1, Rev. C; and C001-5-9604, Sheet 1, Rev. 1;

The Model No. NUPAC 100 packaging is fabricated in accordance with Nuclear Packaging, Incorporated Drawing No.: BA-20-200D, Sheets 1 and 2, Revision 2; or

The Model No. CNS 7-100 packaging is fabricated in accordance with Nuclear Packaging Incorporated Drawing No. BA-20-200D, Sheets 1 and 2, Revision B.

(b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 13,000 pounds. Internal decay heat must not exceed 25 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

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For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
7. Except for close fitting contents, shoring must be placed between secondary containers (or activated components) and the cask cavity to prevent movement during normal conditions of transport.
 8. The lid and shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit; and the secondary lid lifting lug must not be used for lifting the primary lid.
 9. Prior to each shipment, the packaging lid seals if opened (or if the security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.
 10. The drain line must be appropriately plugged and sealed prior to transport.
 11. Each cask must be leak tested in accordance with Appendix 8.3 of the application on or before September 1, 1984 and at least once every twelve (12) months thereafter. The sensitivity of the test must be at least 1×10^{-3} atm cm³/sec (STP). Each cask which has been damaged or repaired in the area of a seal must also be tested prior to subsequent use.
 12. Packagings fabricated after August 31, 1980, must be constructed of A-516, Grade 70 carbon steel instead of A-36 carbon steel.
 13. Fabrication of packagings without a drain line is not authorized.
 14. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
 15. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
 16. Expiration date: November 30, 1988.

Page 4 - Certificate No. 9080 - Revision No. 10 - Docket No. 71-9080

REFERENCES

Westinghouse Hittman Nuclear Incorporated application dated February 27, 1984.

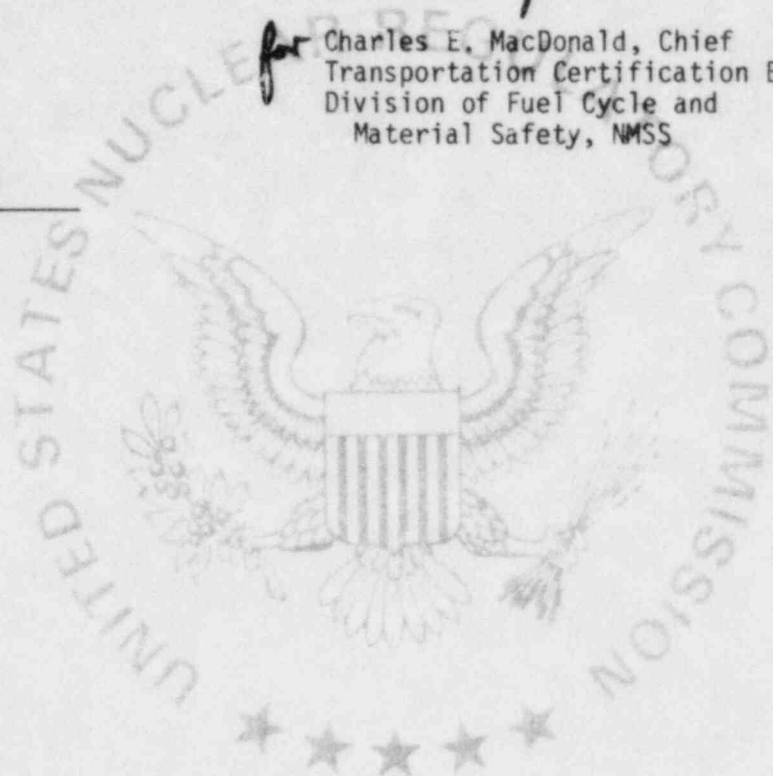
Chem-Nuclear Systems, Inc. supplement dated: June 29, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984



**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
9081	6	USA/9081/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Chem-Nuclear Systems, Inc. 220 Stoneridge Drive Columbia, SC 29210	Chem-Nuclear Systems, Inc. application dated June 29, 1982, as supplemented.

c. DOCKET NUMBER 71-9081

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.: CNS 1-13C
 - (2) Description
A steel encased lead shielded shipping cask. The packaging is a steel double-walled, lead-filled circular cylinder. A steel, plug-type, lead-filled lid is attached with twelve, 1-1/4" bolts; and a silicone gasket. Outer steel sheets are separated from the cask walls with small diameter wires. The lead shielding is 5" in the sides, 6" in the base and 5-3/4" in the lid. Two bolted-on steel lugs are for lifting only. The lid has a steel U-bar for lifting. The cavity drain line is closed with a plug. The cask is 39" in diameter and 68-1/2" long. The cavity is 26-1/2" in diameter and 54" long. The package weight is about 26,000 pounds.
 - (3) Drawings
The packaging is constructed in accordance with Chem-Nuclear Systems, Inc., Drawing Nos. C-110-E-0005, Sheets 1 and 2, Rev. A; and C-112-B-006, Rev. A.
- (b) Contents
- Type, form and maximum quantity of material per package
- (i) Greater than Type A quantity of byproduct material as solid metal. Decay heat not to exceed 600 watts; or
 - (ii) Decay heat not to exceed 5 watts, and:
Process solids, either dewatered, solid, or solidified in a secondary sealed container meeting the requirements for low specific activity material; or
Solid reactor components in secondary containers, as required, that meet the requirements for low specific activity material.

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6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
- 7. Shoring must be provided to minimize movement of contents during accident conditions of transport.
 - 8. Maximum gross weight of the contents, secondary container, and shoring is limited to 5,000 pounds.
 - 9. The lid closure to the cask shall be secured by twelve, SA-354, Type BD, 1-1/4"-7 UNC x 2-1/4" long bolts torqued to 320 ft-lbs + 10% (lubricated) or 420 ft-lbs + 10% (dry).
 - 10. The cask shall be delivered to a carrier dry and the cavity drain line shall be sealed with appropriate sealant applied to threads of pipe plug.
 - 11. Prior to each shipment, the leak test described in Section 8.2 of the application must be performed. No package is to be delivered to a carrier for transport with a detectable leak using the method of Section 8.2.
 - 12. Radiation measurements shall be made to determine that the dose rate does not exceed 30 mrem/hr at one meter from the surface of a dry loaded cask.
 - 13. Prior to each shipment, the lift lugs must be removed from the packaging.
 - 14. The contents described in 5(b)(ii) shall be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

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15. Fabrication of additional packages is not authorized after December 31, 1982.
16. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
17. Expiration date: December 31, 1987.

REFERENCES

Chem-Nuclear Systems, Inc. application dated June 29, 1982.

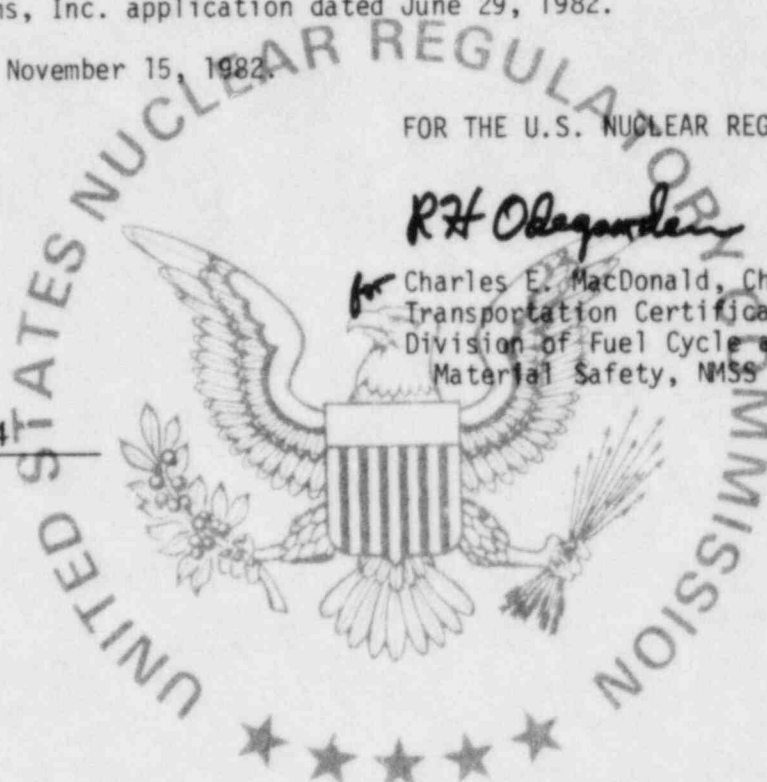
Supplement dated: November 15, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 05 1984



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
9085	3	USA/9085/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Teledyne Energy Systems 110 West Timonium Road Timonium, MD 21093	Teledyne Energy Systems application dated March 3, 1977, as supplemented.

c. DOCKET NUMBER 71-9085

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.: SENTINEL 8S
- (2) Description

The packaging contains a thermoelectric generator with 55,000 ci of strontium 90 titanate or strontium 90 fluoride. The dimensions are 32.2 inches in height by 37.53 inches in diameter. The package is welded to a 39.5-inch square, steel pallet, which is 4 inches high.

The contents are housed in a stainless steel or Hastelloy C-276 liner. The liner, with its pressed cap, is contained within a fuel capsule (5.5" x 3.735" OD). The capsule lid is threaded for strength and welded (minimum weld penetration of 0.055" is specified) to give a positive seal. The wall thickness of the capsule is a minimum of 0.3475 inch. The fuel capsule is constructed of Hastelloy C-276 (or Uniloy HC). The capsule is inserted into the tungsten biological shield (8.367" x 6.467" OD), and the shield plug is bolted into place using three steel bolts, equally spaced on a 5.093-inch bolt circle.

The tungsten shield is held in a horizontal position within the generator's aluminum housing by the sized Min-K-1301 thermal insulation. Min-K and load bearing Glasrock are used to support the shield base. A retaining ring is used to preload the Min-K and to dampen any vibrational loads.

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(2) Description (continued)

The finned 6061-T6 aluminum housing forms the outer protective shell of the generator. During shipment, the detachable fin extensions will be bolted to the fins. This increases the fin diameter from 22 inches to 26 inches, holding the generator securely in the shipping cask body (5.68" min. wall thickness, ASTM A-181 grade 2 forged steel). The interface between the overlapping fin surfaces is coated with a heat transfer compound (DOW Corning 340). The total system weight is approximately 7,400 pounds.

(3) Drawings

The principal features of the package are shown in the drawings contained in the Teledyne Energy Systems application, dated March 3, 1977.

(b) Contents

(1) Type and form of material

- (i) Strontium 90 titanate doubly encapsulated in a stainless steel liner and Hastelloy or Uniloy HC capsule which meet the requirements of special form radioactive material; or
- (ii) Strontium fluoride ($^{90}\text{SrF}_2$) doubly encapsulated in a Hastelloy or Uniloy fuel capsule, with a Hastelloy C-276 liner which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

55,000 curies.

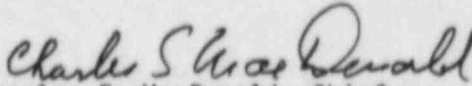
- 6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 7. Expiration date: April 30, 1987.

REFERENCES

Teledyne Energy Systems application dated March 3, 1977.

Supplement dated: March 17, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

SEP 06 1983

430

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9086	b. REVISION NUMBER 11	c. PACKAGE IDENTIFICATION NUMBER USA/9086/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Westinghouse Hittman Nuclear
Incorporated
9151 Rumsey Road
Columbia, MD 21045

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Hittman Nuclear & Development Corporation application
dated March 1, 1983.

71-9086

c. DOCKET NUMBER

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.: HN-100 Series 1

(2) Description

A steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 82.5 inches high by 81.5 inches in diameter. The cask cavity is 74.5 inches high by 75.63 inches in diameter. The cask side wall consists of a 3/8-inch thick inner steel shell, a 1-3/4-inch lead shell, and a 7/8-inch thick outer steel shell. The base is a 4-inch thick steel plate which is welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is a 4-inch thick steel plate which is stepped to mate with the steel flange. The cask closure is sealed by a Viton or Buna-N O-ring gasket located between the lid and steel flange. Positive lid closure is accomplished by thirty, 1-inch studs and nuts. The lid contains a centrally located 4-inch stepped steel shield plug. The shield plug is sealed by a Viton or Buna-N O-ring gasket, and sixteen, 1/2-inch studs and nuts are used to provide positive closure.

Tie-down is accomplished by four tie-down lugs welded to the cask body. There are three casks lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is 50,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Hittman Nuclear & Development Corporation Drawing Nos. STD-02-028, Revision 7; STD-02-029, Revision 5; and STD-02-030, Revision 4.

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5. (b) Contents

(1) Type and form of material

Process solids either dewatered, solid or solidified meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 14,500 pounds except the weight of the contents in HN-100 Series 1, Unit 5 must not exceed 6,900 pounds. Internal decay heat must not exceed 7 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

8. The lid and shield plug lifting lugs must not be used for lifting the cask, and shall be covered in transit.

9. Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.

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10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: March 31, 1988.

REFERENCE

Hittman Nuclear & Development Corporation application dated March 1, 1983.

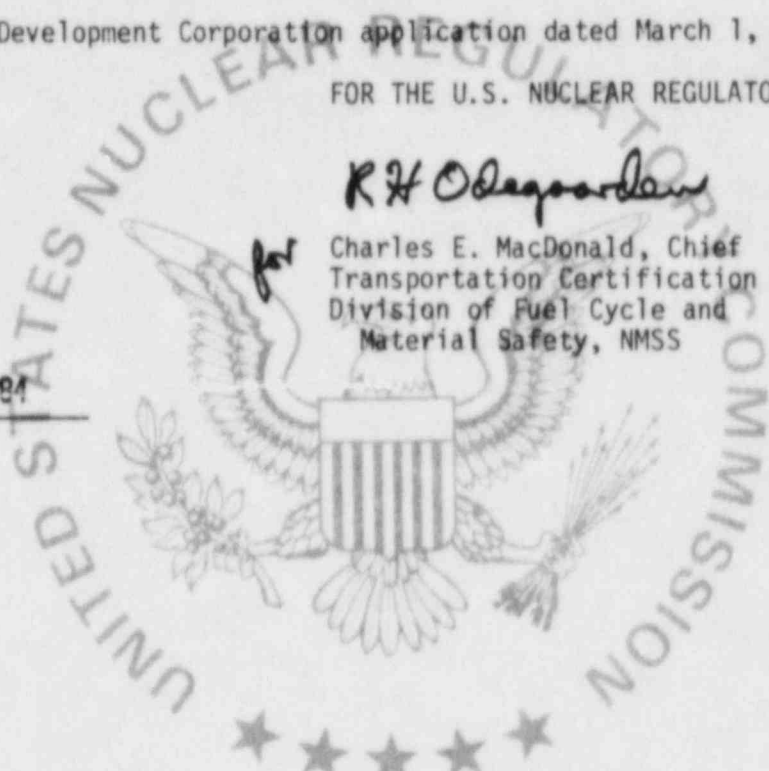
FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

JUL 12 1984



**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
9089	7	USA/9089/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION	c. DOCKET NUMBER
Westinghouse Hittman Nuclear Corporation Inc. 9151 Rumsey Road Columbia, MD 21045	Westinghouse Hittman Nuclear Inc. Application dated March 13, 1984.	71-9089

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.: HN-100S
- (2) Description

The cask is a steel annulus 84-1/4 inches high by 81-5/8 inches in diameter. The cavity is 75-1/2 inches high by 75-5/8 inches in diameter. The side walls consist of two plies of 1-1/2-inch steel. The 3-inch steel base is integrally welded to the cylinder. The lid is a 3-inch steel plate, stepped to mate with the upper flange of the cylinder. A centrally located shield plug is similarly constructed. The lid and plug are attached with stud-bolts and nuts and sealed with Buna N O-ring gaskets. A plugged drain line and/or optional vent/test in the secondary lid connection is provided. Four skewed lugs welded to the outer shell are used for tie down. There are three cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 43,000 pounds.

(3) Drawings

The packaging is fabricated in accordance with Hittman Nuclear & Development Corporation Drawing Nos.: C001-5-9128, Rev. 3 and C001-5-9129, Rev. 3.

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5. (b) Contents

(1) Type and form of material.

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package.

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents, secondary containers, and shoring must not exceed 17,000 pounds and the internal decay heat load must not exceed 2 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between the secondary containers and cask cavity to minimize movement during normal conditions of transport.

8. The lid and shield plug lifting lugs must not be used for lifting the cask, and shall be covered in transit.

9. Packagings without a drain line must be provided within the operational vent/test connection in the cask secondary lid.

10. The drain line and optional vent/test connection must be appropriately plugged and sealed prior to transport.

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- 11. Prior to each shipment, the packaging lid seals, if opened (or if the security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.
- 12. By September 1, 1984, the packaging must be leak tested at least once every twelve (12) months in accordance with Leak Test Procedure STD-P-02-002, Rev. 0, dated February 2, 1984. Each cask which has been damaged or repaired in the area of a seal must also be tested prior to subsequent use; normal gasket maintenance does not require a subsequent test.
- 13. Packagings fabricated after November 30, 1983, must be constructed of A-516, Grade 70 carbon steel.
- 14. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
- 15. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 16. Expiration date: November 30, 1988.

REFERENCE

Westinghouse Hittman Nuclear Incorporated application dated March 13, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegaard

for Charles E. Macdonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9090	4	USA/9090/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Allied Chemical Company
Allied Corporation
P.O. Box 430
Metropolis, IL 62960

Allied Chemical Corporation application
dated May 18, 1977, as supplemented.

c. DOCKET NUMBER

71-9090

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 Nos.: 48 OM, 48 H and 48 HX

(2) Description

Metal 48-inch UF₆ cylinder. Gross weight nominal 30,150 lbs.

(3) Drawing

The 48 OM packaging is as described and constructed in accordance with Allied Chemical Corporation Drawing No. 515172, Revision B and Job Specification JSP-226, dated March 4, 1966, revised January 24, 1967. The 48 H packaging is described and constructed in accordance with Union Carbide Corporation Drawing No. E-M-14864-A, Revision B, and Equipment Specification No. ES-CMD-14864-1, Revision 0, dated September 29, 1978. The 48 HX packaging is as described and constructed in accordance with Union Carbide Corporation Drawing No. E-M-14864-B, Revision 0, and Equipment Specification No. ES-CMD-14864-2, Revision 0, dated February 20, 1979.

(b) Content

(1) Type and form of material

Uranium hexafluoride (UF₆) in solid form which meets the requirements as low specific activity material.

Page 2 - Certificate No. 9090 - Revision No. 4 - Docket No. 71-9090

5. (b) Content (continued)

(2) Maximum quantity of material per package

Maximum U-235 enrichment, pounds UF₆, and U-235 content for the cylinder model as follows:

Max. Enrichment w/o U-235	Max. UF ₆ Pounds	Max. U-235 kgs
1.0	27,030	82.9

6. Valve protectors must be provided as described in ORO-651, Rev. 3.
7. The fabrication (new packagings only), assembly (new packagings only), testing, maintenance, and use of packagings must be in accordance with the requirements of ORO-651, Rev. 3 except that design shell thickness is 5/16", minimum allowable shell thickness is 1/4", and the routine hydrostatic test is to be performed at 200 lb/sq in. Materials of construction for the 48 OM packaging are given in Job Specification JSP-226 and for the 48 H packaging in Equipment Specification No. ES-CMD-14864-1, Revision No. 0 (alternate A285 steel not authorized).
8. The Model No. 48 HX packaging must be transported only when a determination has been made by the shipper that the average daily temperature or ambient temperature during the shipment will not be less than 30°F and the temperature of the contents at the time of delivery to carrier for transport is at least 30°F.
9. The package must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the shipper.
10. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.
11. Expiration date: May 31, 1987.

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REFERENCES

Allied Chemical Corporation application dated May 18, 1977.

Uranium Hexafluoride Handling Procedures and Container Criteria, ORO-651, Rev. 3, August 1972.

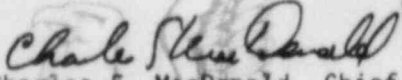
Testing of Ten-Ton Uranium Hexafluoride Cylinders, KY-500, October 22, 1965.

Testing of Fourteen-Ton Uranium Hexafluoride Cylinders, KY-549, May 15, 1968.

Department of Energy supplement dated: January 5, 1979.

License Application for Type 48 HX Cylinder for Shipment of Natural Assay UF-6, KY-697, February 26, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9094	b. REVISION NUMBER 7	c. PACKAGE IDENTIFICATION NUMBER USA/9094/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Chem-Nuclear Systems, Inc. 220 Stoneridge Drive Columbia, SC 29210	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Chem-Nuclear Systems, Inc. application dated March 31, 1980.
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c. DOCKET NUMBER **71-9094**

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.: CNS 14-195-H

(2) Description

A steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder 83-1/8-inch diameter by 89-7/8-inch with a 77-inch diameter by 80-1/8-inch cavity. Lead shielding is 2-3/16-inch thick, and is encased in an outer steel shell 3/4-inch thick and inner steel shell 1/8-inch thick. Positive closure of the silicone rubber-sealed lid is provided by twelve, 1-1/4-inch diameter cap screws. A secondary lid with a Neoprene seal uses eighteen, 3/4"-10UNC bolts for closure. The cask is welded to a 96-inch square based plate, has two lifting trunnions, three lid lift rings and one secondary lid lifting ring. Package gross weight is 56,500 pounds.

(3) Drawing

The packaging is fabricated in accordance with Chem-Nuclear Systems, Inc. Drawing No. 1-189-101, Sheet 1 of 1, Rev. A-F.

(b) Contents

(1) Type and form of material

(i) Process solids, either dewatered, solid or solidified in secondary containers, meeting the requirements for low specific activity material; or

(ii) Solid reactor components in secondary containers, as required that meet the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 17,700 pounds.

Page 2 - Certificate No. 9094 - Revision No. 7 - Docket No. 71-9094

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

- 7. Shoring must be placed between secondary containers (or activated components) and the cask cavity to prevent movement during normal conditions of transport.
- 8. The lid lifting lugs must not be used for lifting the cask end shall be covered in transit.
- 9. Prior to each shipment the lid gaskets must be inspected. These gaskets must be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.
- 10. Packagings fabricated after March 31, 1980, must be constructed of A-516, Grade 70 carbon steel instead of A-36 carbon steel.
- 11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
- 12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 13. Expiration date: May 31, 1985.

Page 3 - Certificate No. 9094 - Revision No. 7 - Docket No. 71-9094

REFERENCE

Chem-Nuclear Systems, Inc. application dated March 31, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegarden

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984



**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
9096	7	USA/9096/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

Chem-Nuclear Systems, Inc. application
dated April 14, 1980, as supplemented.

c. DOCKET NUMBER 71-9096

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.: CNS 21-300
- (2) Description

A steel encased lead shielded cask for low specific activity radioactive material. The cask is a right circular cylinder with 86-3/4-inch OD by 117-1/4-inch height, and a cavity 83-inch ID by 109-1/4-inch height. The 1-inch thick lead shield is supported by outer and inner steel shells 3/4-inch and 1/8-inch thick. The inner plates of the lid and base are laminated steel plates with a total thickness of 1/2-inch. Positive closure of the silicone rubber sealed lid is provided by twelve, 1-1/4-inch diameter cap screws. A secondary lid with a Neoprene seal uses eighteen, 3/4-inch diameter bolts for closure. The cask is welded to a 96-inch square base plate and has two lifting trunnions, three lid lift rings and one secondary lid lift ring. Package gross weight is 57,450 pounds.

(3) Drawings

The packaging is fabricated in accordance with Chem-Nuclear Systems, Inc. Drawing Nos. 1-298-101, Rev. J, and C-114-D-0006, Rev. A.

Page 2 - Certificate No. 9096 - Revision No. 7 - Docket No. 71-9096

5. (b) Contents

(1) Type and form of material

- (i) Process solids, either dewatered, solid or solidified in secondary containers, meeting the requirements for low specific activity material; or
- (ii) Solid reactor components in secondary containers, as required that meet the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers, auxiliary shield, and shoring not exceeding 27,250 pounds.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring must be placed between secondary containers (or activated components), auxiliary shield, and the cask cavity to prevent movement during normal conditions of transport.

8. The auxiliary shield shown in Drawing No. C-114-E-0004, Rev. No. B, may be used for the shipment of solidified wastes and solid reactor components.

Page 3 - Certificate No. 9096 - Revision No. 7 - Docket No. 71-9096

9. The lid lifting lugs must not be used for lifting the cask and shall be covered in transit.
10. Prior to each shipment the lid gaskets must be inspected. The gaskets shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.
11. Packagings fabricated after April 14, 1980, must be constructed of A-516, Grade 70 carbon steel instead of A-36 carbon steel.
12. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
13. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
14. Expiration date: May 31, 1985.

REFERENCES

Chem-Nuclear Systems, Inc. application dated April 14, 1980.

Supplement dated: June 28, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard
for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, M55

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9098	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/9098/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions"
- 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. PREPARED BY (Name and Address):

Union Carbide Corporation
P.O. Box 324
Tuxedo, NY 10987

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Union Carbide Corporation application dated
August 24, 1982.

c. DOCKET NUMBER **71-9098**

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 Nos.: UCC-20WC-2 and UCC-20WC-2A

(2) Description

Steel encased, wooden outer protective jackets with a uranium shielded cask and inner steel containment vessel. The protective jackets are built to DOT Specification 20WC-2. The shielded casks have depleted uranium shields encapsulated in steel with a gasketed and bolted flange closure with six, 3/8"-16 UNC-2A x 3/4" long bolts. The inner containment vessel is a 2.73" OD x 5.56" long 416 stainless steel, gasketed and threaded DOT Specification 2R container. The gross weight of the packages is about 400 pounds.

Model No.	<u>UCC-20WC-2</u>	<u>UCC-20WC-2A</u>
Protective jackets overall dims, in	24-1/4x22x28-3/4	24-1/4x18x26-1/4
U(D) thickness, in	2	1.8
Cavity dims, in	3.1x6H	3.1x6H

(3) Drawings

The packagings are constructed in accordance with Union Carbide Corporation Drawing Nos. ★ ★ ★ ★ ★

Model No. UCC-20WC-2
T01259, Rev. B and T00964, Rev. F

Model No. UCC-20WC-2A
T01354, Rev. E and T01326, Rev. C

Page 2 - Certificate No. 9098 - Revision No. 4 - Docket No. 71-9098

5. (Continued)

(b) Contents

(1) Type and form of material

Mo-99/Tc-99 in normal form as solids or liquids.

(2) Maximum quantity of material per package

1,000 curies

6. Contents shall be contained within inner container described by Union Carbide Drawing No. 101401, Rev. B. The inner container must show no leakage when tested to a sensitivity of at least 1×10^{-7} atm-cm³/sec (1 atm of helium at 25°C leaking to a 1×10^{-2} atm ambient). The inner container must be leak tested, as described above, within 12 months prior to use.
7. The loaded inner container must show no leakage when tested to a sensitivity of at least 1×10^{-5} atm-cm³/sec (1 atm of air at 25°C leaking to a 1×10^{-2} atm ambient) prior to each shipment. A new Neoprene gasket must be used on the inner container prior to final closure for each shipment.
8. Structural parts of the packaging which could be used as tie-down devices must be securely covered or locked during transport in such a manner as to prevent its use for that purpose.
9. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: September 30, 1987.

REFERENCES

Union Carbide Corporation application dated August 24, 1982.

Supplement dated: June 27, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 18 1983

**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
9099	3	USA/9099/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions.'
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
550 Second Street
Idaho Falls, ID 83401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Aerojet Nuclear Company Report No. TR-466,
June 30, 1975.

c. DOCKET NUMBER

71-9099

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.: ATR
- (2) Description

The inner container is a right parallelepiped 69-1/2 inches x 26-13/16 inches x 6-11/16 inches, constructed of 3/4-inch plywood, covered with 16-gauge steel. The top and bottom are lined with high density polyethylene foam with 0.020-inch cadmium plate. Wood spacers covered with sponge rubber and 0.020-inch cadmium plate provide separation for four fuel assemblies. Positive closure is provided by a continuous hinge and two wire sealed hinge pins provide access.

The inner container is enclosed within an overpack, 79 inches x 27 inches x 11 inches, constructed of 1-inch plywood, framed by steel angle members and covered with 18-gauge steel. Aluminum, honeycomb impact limiters are fixed to the ends of the overpack. Positive closure of the overpack is provided by four hinge pins which are secured in place using 1/16-inch diameter cotter pins. The package weight is approximately 853 pounds.

Page 2 - Certificate No. 9099 - Revision No. 3 - Docket No. 71-9099

5. (a) Packaging (continued)

(3) Drawings

The packaging is fabricated in accordance with Idaho Nuclear Corporation Drawing Nos. 035927, Rev. B; 035928, Rev. C; 035929, Rev. C; 035932, Rev. A; and Phillips Petroleum Company Drawing Nos. ATR-E-1052, Rev. C and ATR-E-1053, Rev. C.

(b) Contents

(1) Type and form of material

Solid, unirradiated material, as either clad rods or plates or fuel elements. The concentration of the U-235 isotope must not exceed 700 grams per linear foot in each of the four compartments.

(2) Maximum quantity of material per package not to exceed Type A quantities

Total U-235 content not to exceed 12,000 grams per package.

(c) Fissile Class

6. The contents must be maintained within its compartment and the active fuel length must be completely within the region of the cadmium covered spacers. Wood spacers may be used to accomplish this.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: November 30, 1987.

REFERENCE

Aerojet Nuclear Company Report No. TR-466, June 30, 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9100	4	USA/9100/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Kerr-McGee Nuclear Corporation
Kerr-McGee Center
Oklahoma City, OK 73125

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Kerr-McGee Nuclear Corporation application
dated March 16, 1978, as supplemented.

c. DOCKET NUMBER

71-9100

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.: KKP-20-4950

(2) Description

The container is a 4,950 gallon stainless steel cylindrical tank supported by a truss-type framework on a motor vehicle trailer. The 1/4" thick tank is 82-1/2" in diameter with an overall length of 229" including the torispherical end bulkheads. Seven flanged, asbestos-gasketed access ports and a rupture disk are provided on the top surface. The tank is covered with an aluminum shell enclosing 3" fiberglass insulation. The tank is supported by bolsters attached to a 238-1/2" x 96" x 96" angle, channel and I-beam frame which is attached to a trailer at four points. Excluding the trailer, the gross weight of the packaging is 55,000 pounds.

(3) Drawings

The packaging is fabricated according to Fruehauf Corporation Drawing No. BKY 9010-1, Revision A. The container chassis is described in Fruehauf Corporation Drawing No. B-ND4798, Revision B.

Page 2 - Certificate No. 9100 - Revision No. 4 - Docket No. 71-9100

5. (b) Contents

(1) Type and form of material

- (i) Uranium ore concentrate in a water slurry form which meets the requirements as low specific activity material.
- (ii) Solid residues in a water slurry form resulting from the chemical processing of natural uranium concentrates to produce uranium compounds. The chemical residue meets the requirements as low specific activity material and the aqueous solution has a pH between 5 and 7.

(2) Maximum quantity of material per package

42,000 pounds

6. Prior to each shipment, an inspection of the tank and support frame shall be conducted according to the procedures stated in the Kerr-McGee Nuclear Corporation letter dated April 28, 1978. If the inspection reveals any deformation or weld cracking, the package shall be removed from service until repaired. In addition, a liquid penetrant test of the entire length of the ring to tank weld at the bolsters shall be conducted in accordance with ASME, Section V, Article 6, at least every 10,000 miles (loaded). If any cracks, as defined in accordance with ASME, Section VIII, Division 1, Appendix 8, Paragraph UA-93(a), are detected, the packaging shall be repaired and reinspected prior to use and shall be inspected prior to each shipment thereafter.

Any defects shall be reported in accordance with 10 CFR §71.95.

7. If loaded, the container shall not be lifted.
8. The package authorized by this certificate shall be transported on a motor vehicle assigned for the sole use of the licensee.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: May 31, 1988.

Page 3 - Certificate No. 9100 - Revision No. 4 - Docket No. 71-9100

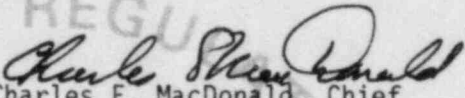
REFERENCES

Kerr-McGee Nuclear Corporation Application dated March 16, 1978.

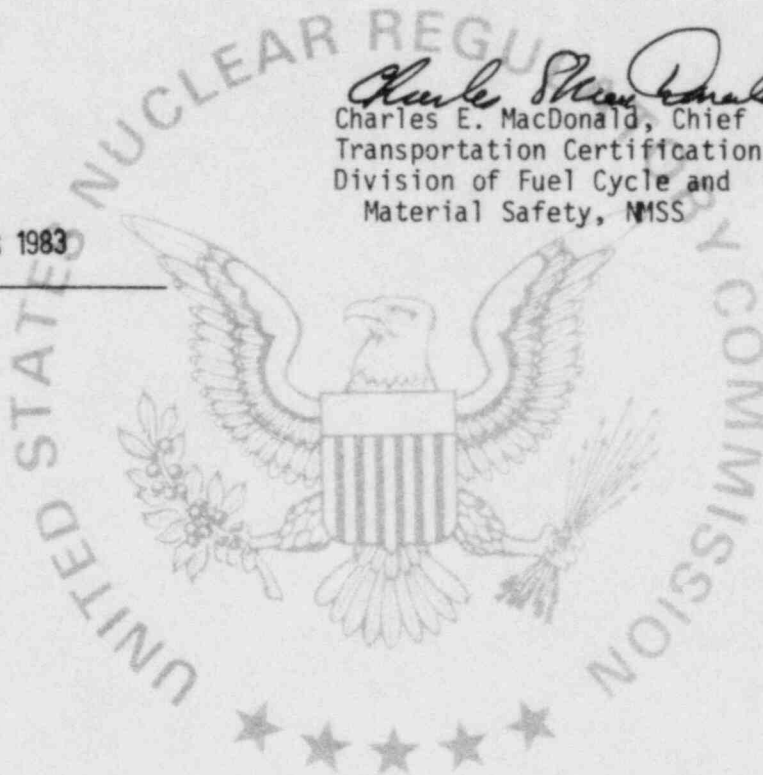
Supplements dated: April 10 and 28, 1978; and August 3, 1983.

Ranchers Exploration and Development Corporation supplement dated October 19, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 26 1983



**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
9102	3	USA/9102/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Neutron Products, Incorporated
22301 Mt. Ephriam Road
Dickerson, MD 20753

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Neutron Products, Incorporated application
dated August 31, 1977, as supplemented.

c. DOCKET NUMBER

71-9102

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.: NPI-20WC-6
- (2) Description

A steel encased, lead shielded cask contained within a DOT Specification 20WC-6 wooden overpack. The cask is 24 inches in diameter with a 3/8-inch thick steel spherical shell and a cavity formed by an 8-1/4-inch ID by 3/8-inch thick steel tube. Positive closure of the shielded cask is accomplished by bolted end covers at each end of the cavity. The maximum package gross weight is 6,000 pounds.

(3) Drawing

The packaging is constructed in accordance with Neutron Products, Incorporated Drawing No. 240010, Rev. C and DOT Specification 20WC-6.

Page 2 - Certificate No. 9102 - Revision No. 3 - Docket No. 71-9102

5. (b) Contents

(1) Type and form of material

Cobalt 60, as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

The maximum activity shall not exceed 9,500 curies. The maximum internal decay heat shall not exceed 150 thermal watts.

- 6. The contents shall be secured in the drum assembly (Item 11) so as to restrict movement in any direction to less than 0.25 inch by lead, steel or tungsten full diameter plugs and spacers.
- 7. The gross weight of the packaging shall not exceed 6,000 pounds and the inner shielded cask shall be snug-fitting within the wooden overpack.
- 8. The packaging authorized by this certificate is hereby approved for use under general license provisions of 10 CFR §71.12.
- 9. Expiration date: April 30, 1988.

REFERENCES

Neutron Products, Incorporated application dated August 31, 1977.

Supplement dated: February 6, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9103	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/9103/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address) Nuclear Assurance Corporation 5720 Peachtree Parkway Norcross, GA 30092	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION NL Industries, Inc. application dated September 7, 1977, as supplemented.
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c. DOCKET NUMBER **71-9103**

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.: NLI-6502

(2) Description

A steel, lead, and depleted uranium shielded shipping cask. Its overall dimensions are 33.5 inches in diameter by 130 inches long. The loaded cask weighs about 45,300 pounds. The wall thickness of the cavity and outer shell is 1/2 inch. The wall thickness of the inner shell is 1 inch. The main body of the cask is divided into two regions. The inner region, which is a maximum of 5-3/4 inches thick, contains uranium shielding angles at the four corners, the remainder of the shielding region is filled with chemical grade lead. The outer (sacrificial) 3-inch thick region is filled with lower melting point 6% antimonial lead. The cask contains six (6) fusible "weep holes" around the cask at each end. This sacrificial region also contains 10 layers of 0.018-in terne plate. The main body of the cask is equipped with two (2) lids, one on each end. The two lids are similar in construction, each being 24.5 inches in diameter and extending 5 inches into the cask recess. The lids, like the main cask body, contain an outer sacrificial region (2" thick containing ten 0.018-in terne discs with the remaining volume filled with 6% antimonial lead) and an inner region (4-5/8" thick) containing chemical grade lead. The sacrificial region in each lid is fitted with exterior weep holes.

Page 2 - Certificate No. 9103 - Revision No. 4 - Docket No. 71-9103

5. (a) (2) Description (Cont'd)

One lid contains a 1/2-inch drain line and valve. The other lid contains two, 1/2-inch lines for a pressure relief valve and the other line is capped.

The fuel rods are contained within an approximate 11-1/2-inch square by 128-1/2-inch long openwork basket constructed of stainless steel angle and strap. The basket has a full-length lid along one side, for horizontal loading, and a lid on one end for vertical unloading. A vertical, stainless steel-clad Boral poison plate divides the basket into two, full-length halves, and two partial poison plates are incorporated into the sides of the basket.

A metal screen enclosure surrounds the package in transport to serve as a sun-shade and prevent inadvertent use of structural parts of the package, other than the tie-down devices for securing the package to the vehicle during transport.

The cask rests horizontally on its integral supporting structure at each end, and the supporting structure is bolted to a separate structure attached to the deck of the special trailer provided for its use.

(3) Drawings

The Model No. NLI-6502 shipping package is constructed in accordance National Lead Company Drawing Nos.:

5797-P, Rev. 1	Details-Safety Shield
5798-0, Rev. 1	Cask Tie-Down
6502-01, Rev. 5	Basket Details
6502-03, Rev. 4	Latch and Basket Details
6502-04, Rev. 3	Basket and Lid Assembly
6502-07, Rev. 5	Cask
6502-08, Rev. 4	Lid Assembly and Details

5. (b) Contents

(1) Type and form of material

Irradiated NRU-NRX aluminum-uranium alloy fuel rods enriched in the U-235 isotope with the following specifications:

	<u>NRU</u>	<u>NRX (MKI&IV)</u>
Number of elements per rod	12	7
Maximum U-235 content per rod prior to irradiation, g	495 (1.8 per cm)	550 (2.0 per cm)
Minimum average burnup, %	45	45
Minimum decay time, days	120	120

(2) Maximum quantity of material per package

The maximum decay heat load per package not to exceed 14,000 Btu/hr, and 20 NRU fuel rods or 28 NRX fuel rods per package.

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

6. Poison inspection and loading of fuel rods must be subject to the following conditions:

- (a) Poison inspection and loading of fuel rods in accordance with Section VII-B.2.(B).(3.) (pp. VII-10 thru VII-11) of the application, and
- (b) The package must not be loaded with a mass which exceeds 75% of critical, determined by extrapolation to zero reciprocal count rate.

7. Dummy fuel rods consisting of empty aluminum pipes must be installed in every fuel rod position not occupied with fuel.

8. The cask cavity must be dry (no free water) when delivered to a carrier for transport.

Page 4 - Certificate No. 9103 - Revision No. 4 - Docket No. 71-9103

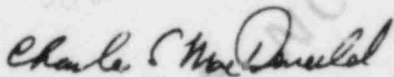
9. The cavity pressure relief valve must be tested at set pressure every twelve (12) months.
10. Additional contents in accordance with Nuclear Assurance Corporation application dated February 17, 1982. Fuel rods must be contained within a fuel basket to minimize damage to the rods during normal conditions of transport.
11. Prior to each shipment, the Buna-N rubber lid gasket(s) (if opened) must be inspected. These gaskets must be replaced if inspection shows any defects or replace both gaskets every twelve (12) months, whichever occurs first. Cavity lines must be sealed with appropriate sealant applied to threads of pipe caps or plugs.
12. The cask contents must be so limited under normal conditions of transport that the dose rate will not exceed 10 mrem/hr at one meter from the external surface of the cask.
13. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
14. Expiration date: May 31, 1988.

REFERENCES

NL Industries, Inc. application dated September 7, 1977.

Supplement dated: May 1, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9105	b. REVISION NUMBER 5	c. PACKAGE IDENTIFICATION NUMBER USA/9105/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address) Chem-Nuclear Systems, Inc. 220 Stoneridge Drive Columbia, SC 29210	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION Chem-Nuclear Systems, Inc. application dated March 4, 1983, as supplemented.
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c. DOCKET NUMBER **71-9105**

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.: CNS 6-101
 - (2) Description

The container is an end loaded steel rectangular box for low specific activity material held in secondary containers. The container is constructed of 4-inch thick steel walls welded to form a 34-1/2-inch wide by 41-inch high by 13-foot long cavity. Positive closure of the 4-inch thick by 42-inch by 48-inch hydraulically actuated door is accomplished with twelve, 1.5-inch bolts. Four lugs are welded to sides along the top. The package gross weight is 54,200 pounds.
 - (3) Drawings

The package is fabricated in accordance with Chem-Nuclear Systems, Incorporated Drawing Nos.:

2000-D-201, Sheets 1 thru 7, Rev. C; and
2000-D-202, Sheet 1, Rev. F
- (b) Contents
- (1) Type and form of material

Solid nonfissile irradiated metal hardware meeting the requirements for low specific activity materials, in secondary steel drums which meet the requirements for DOT Specification 7A packaging.
 - (2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with weight of the contents, secondary containers, and shoring not exceeding 6,000 pounds. The maximum decay heat must not exceed 10 watts.

Page 2 - Certificate No. 9105 - Revision No. 5 - Docket No. 71-9105

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
7. Shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.
8. The twelve, 1-1/2" door (closure) bolts must have a minimum yield strength of 130,000 psi.
9. The packaging must be marked in the area of each lifting lug giving the restrictions on use of the lifting lugs as specified in Revision No. 1 of Section 2.4.3 of the application. The lifting lugs must be made inoperable as required by 10 CFR §71.45(a).
10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: December 31, 1988.

Page 3 - Certificate No. 9105 - Revision No. 5 - Docket No. 71-9105

REFERENCES

Chem-Nuclear Systems, Inc. application dated March 4, 1983.

Supplement dated: September 30, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegaard

for

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9107	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9107/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Technical Operations, Inc. Northwest Industrial Park Burlington, MA 01803	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Technical Operations, Inc. application dated December 30, 1982.
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c. DOCKET NUMBER **71-9107**

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.: 771
- (2) Description

The Model No. 771 shipping container is designed for use as a source changer, storage container and Type B Shipping Container for radiographic sources in special form. The capacity of the container is 110 curies of cobalt 60 as special form. The container will accept certain Tech/Ops wire mounted radiographic sources which have been deemed to meet the requirements of special form. The Model No. 771 Source Changer measures 23 inches long, 24 inches wide and 20 inches high. The radioactive source assembly is housed in a Zircalloy or Titanium "S" tube. The "S" tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the inner container is filled with a rigid polyurethane foam. The gross weight of the container is 690 pounds.

Page 2 - Certificate No. 9107 - Revision No. 2 - Docket No. 71-9107

5. (3) Drawing

The packaging is constructed in accordance with Technical Operations, Inc. Drawing No. 77190, Sheets 1 through 6, Rev. 0.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

110 curies

6. Source assemblies for use in this packaging are limited to those assemblies as identified in Section 1-3 of Technical Operations, Inc. application dated December 30, 1982.

7. Nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

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

9. Expiration date: February 29, 1988.

REFERENCE

Technical Operations, Inc. application dated December 30, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9108	6	USA/9108/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

Chem-Nuclear Systems, Inc., application
dated May 31, 1983, as supplemented.

c. DOCKET NUMBER

71-9108

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.: CNS 6-75
- (2) Description

The packaging is a steel encased, lead shielded right circular cylinder for low specific activity radioactive material. The outside dimensions are 62 inches in diameter by 86-5/8 inches long and the cavity dimensions are 53 inches in diameter by 74-1/2 inches long. The 3-1/4-inch annulus between the outer 3/4-inch and inner 1/2-inch steel shells is filled with lead. The base plate consists of a 64-3/4-inch square 1-inch outer plate, 3 inches of lead and a 1/4-inch outer plate. The cover consists of a 1-inch steel outer and a 1/2-inch thick steel inner plate with 2-7/8 inches of lead shielding. A secondary cover, plugging the 20-inch central opening in the cover, is constructed of a 1/4-inch outer plate, 1-1/2 inches of lead, a 1/2-inch plate, 1-3/4 inches of lead and a 1/4-inch inner plate. The covers are Neoprene gasketed and secured by sixteen, 3/4-inch and eight, 5/8-inch bolts, respectively. The cavity is vented through a 1/8-inch plugged tube through the cover and drained through a 1/2-inch plugged tube at the bottom. Three lugs on the cask sides, cover ribs and secondary cover are provided for lifting. Four lugs on the cask shell are used for tie-down. Package gross weight is about 41,300 pounds.

(3) Drawing

The packaging is fabricated according to Chem-Nuclear Systems, Inc., Drawing No. 1036-D-01, Sheets 1 and 2, Revision M.

Page 2 - Certificate No. 9108 - Revision No. 6 - Docket No. 71-9108

5. (b) Contents

(1) Type and form of material

Dewatered or solidified waste meeting the requirements of low specific activity material in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 10,300 pounds. The decay heat load shall not exceed 20 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between the secondary containers and the cask cavity to prevent movement during normal conditions of transport.

8. The cover lifting lugs must not be used for lifting of the cask and must be plugged or covered in transit.

9. Prior to each shipment, the packaging lid seals if opened (or if the security seal is broken), shall be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first.

10. Prior to each shipment, a determination must be made that closure seal replacement is current with the seal replacement schedule.

Page 3 - Certificate No. 9108 - Revision No. 6 - Docket No. 71-9108

11. The packaging must be leak tested at least once every 12 months in accordance with Section 5.2.1 of the application.
12. Fabrication of additional packaging after October 31, 1983 is not authorized.
13. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
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, 1988.

REFERENCES

Chem-Nuclear Systems, Incorporated, application dated May 31, 1983.

Supplements dated: September 9, 1983; and January 27, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

JUL 12 1984

**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
9110	2	USA/9110/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Magnaflux Corporation 7300 West Lawrence Avenue Chicago, IL 60656	Magnaflux Corporation Application Dated February 16, 1978, as supplemented.

c. DOCKET NUMBER 71-9110

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.: MX-IC-100
- (2) Description

The isotope camera is a uranium-shielded, cylindrical, stainless steel container 6-5/8 inches in diameter and 6-3/4 inches long. The special form source is held in place inside a titanium or Zircalloy "S" tube by a stainless steel cable secured with a key-operated locking device on one end. A cable-restrained spacing plug is attached at the other end of the "S" tube. The "S" tube is surrounded with depleted uranium metal as a shielding material. The void space between the uranium and steel shell is filled with polyurethane foam. A carrying handle at the top and a base plate are provided. The gross weight of the container is 49.5 pounds.

(3) Drawings

The packaging is constructed according to Magnaflux Corporation Drawing No. C-211626, Revision Dated 2-9-78.

Page 2 - Certificate No. 9110 - Revision No. 2 - Docket No. 71-9110

5. (b) Contents

(1) Type and form of material

Iridium 192 as a sealed source that meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

100 curies.

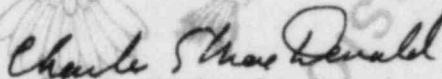
- 6. Name plate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
- 7. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: June 30, 1988.

REFERENCES

Magnaflux Corporation application dated February 16, 1978.

Supplement dated: April 27, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
9111	10	USA/9111/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Chem-Nuclear Systems, Inc.
220 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc., application
dated June 29, 1983, as supplemented.

c. DOCKET NUMBER

71-9111

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 Nos.: CNS 6-80-2 and CNS 6-80-2A
- (2) Description

A steel encased, lead shielded cask for solid radioactive material meeting the requirements for low specific activity material. The overall dimensions of the cask are 70-1/2-inch diameter by 78-5/8-inch height. The cask consists of two concentric carbon steel cylindrical shells surrounding a 4-1/4-inch thick lead shield. The 3/8-inch thick inner shell has a 59-inch ID, and the 1-inch thick outer shell has a 70-1/2-inch OD; the base consists of 4-inch thick welded steel plates of 60-inch diameter and 70-1/2-inch diameter, and a stepped welded lid comprised of two, 4-inch thick steel plates containing a centered 29-inch diameter secondary lid of similar construction with an additional 1-inch thick upper plate. The containment cavity is 59-inch diameter by 58-inches high. Closure of the primary lid is accomplished by eight, 1-1/4-inch bolts or studs and nuts. Both lids on Model No. CNS-6-80-2 are sealed using silicone gaskets. The secondary lid has a redundant Neoprene seal. Both lids on Model No. CNS 6-80-2A are sealed using a double O-ring configuration as shown on Drawing No. C-110-D-0020, Rev. -. A plugged drain port is located at the cask bottom. The cask is lined with 12 gauge stainless steel. Three lift lugs, located on the secondary lid are used for lifting both the cask and the primary lid. Four lugs, welded to the outer shell are used for tie-down. The package gross weight is approximately 51,500 pounds.

(3) Drawing

The packaging is fabricated in accordance with Chem-Nuclear Systems, Incorporated Drawing No. C-110-D-0028, Sheets 1 and 2 of 2, Revision A.

Page 2 - Certificate No. 9111 - Revision No. 10 - Docket No. 71-9111

5. (b) Contents

(1) Type and form of material

- (i) Greater than Type A quantity of byproduct material contained in solids and solidified waste, meeting the requirements for low specific activity material, in secondary containers.
- (ii) Greater than Type A quantity of byproduct material contained in activated solid components meeting the requirements for low special activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 7,500 pounds. The decay heat load must not exceed 60 watts. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.

8. The cavity drain line must be sealed with appropriate sealant applied to the pipe plug threads prior to transport.

Page 3 - Certificate No. 9111 - Revision No. 10 - Docket No. 71-9111

9. Packages must be leak tested initially and at least once every 12 months. A pressure drop test shall be used. The cavity or volume between the double O-ring seals (Model No. CNS 6-80-2A) shall be pressurized to 14.0 psig. Seal acceptance must be based on no observable leakage over a ten minute period using a pressure gauge with a maximum graduation of two pounds and the pressure supply line disconnected from the cask and test fixture.
10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration dated: October 31, 1988.

REFERENCES

Chem-Nuclear Systems, Incorporated application dated June 29, 1983.

Supplement dated: September 19, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Original Signed by
R. H. Odegaard

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: July 12, 1984

**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
9119	4	USA/9119/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
U.S. Department of Energy Division of Naval Reactors Washington, DC 20545	Safety Analysis Report for BAPL 5910 Birdcage ³ shipping container dated February 27, 1968.
	c. DOCKET NUMBER 71-9119

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.: BAPL 5910 Birdcage
- (2) Description

The BAPL 5910 Birdcage shipping container consists of a steel or aluminum box mounted in a slotted angle frame. The inner container is a 14 gauge steel or aluminum box with a hinged and gasketed lid. The cross section of the box is variable but may not exceed 20 in². The box is centered in the outer frame with bolted sections of steel angle. Both the box and the angles enclosing it are sealed with 3/4" steel banding. Aluminum boxes must be completely enclosed with steel. The outer frame is 2 feet square and from 5 to 12 feet long. The frame is constructed of slotted steel angle 3-1/8" x 1-5/8" x 0.104" and is fastened together with 3/8" diameter bolts. The weight of the loaded package varies with the length of the birdcage; a typical weight is 375 pounds for a 12' birdcage.

(3) Drawings

The packaging is constructed in accordance with the description and drawings contained in Bettis Atomic Power Laboratory Safety Analysis Report, WAPD-0(AO)-4191, dated February 27, 1968.

Page 2 - Certificate No. 9119 - Revision No. 4 - Docket No. 71-9119

5. (b) Contents

(1) Type and form of material

Unclad alloy filters and clad fuel elements or fuel assemblies containing U-235.

(2) Maximum quantity of material per package

1,900 grams of U-235. The contents of the inner container is limited to 9 pounds per foot of length of the inner container.

(c) Fissile Class

III

Maximum number of packages per shipment

16

- 6. The melting point of the contents shall not be less than 1,700°F.
- 7. Significant quantities of heavy water, carbon, or beryllium are not permitted.
- 8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 9. Expiration date: March 31, 1988.

REFERENCES

Safety Analysis Report for BAPL 5910 Birdcage shipping container, WAPD-0(A0)-4191; Revision 2, dated February 27, 1968.

Supplements: Bettis Atomic Power Laboratory Letters WAPD-RS(CC)-1269 dated April 1975 and WAPD-RS(CC)-1502 dated June 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
9126	3	USA/9126/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Gamma Industries
P.O. Box 2543
Baton Rouge, LA 70821

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Gamma Industries application
dated May 20, 1978, as supplemented.

c. DOCKET NUMBER

71-9126

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 Nos.: 20, 20A, 50 and 50A

(2) Description

A steel encased, uranium shielded radiographic device. The shipping container is approximately 21 inches long, 23 inches wide and 42 inches high. The radioactive source assembly is housed in a Zircalloy or titanium "S" tube. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The gross weight of the container is 325 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing Nos. 821-1001-128, Rev. 4; 821-1001-129, Rev. 1; and 180-01, Rev. 1.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements for special form radioactive material.

Page 2 - Certificate No. 9126 - Revision No. 3 - Docket No. 71-9126

(b) (2) Maximum quantity of material per package

<u>Model No.</u>	<u>Quantity</u>
20 and 20A	20 curies
50 and 50A	50 curies

6. The source shall be secured in the shielded position of the packaging by the safety plug assembly, source assembly and lockbox assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and safety plug assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The can and side plates must be a minimum of 1/4-inch thick carbon steel. The can and side plates shall be joined by full penetration welds. All other welds shall be fillet welds having sufficient throat thickness to develop strength equal to or greater than the metals being joined.
8. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: October 31, 1988.

REFERENCES

Gamma Industries application dated May 20, 1978.

Supplement dated: October 25, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

for *RH Odgaard*
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: OCT 06 1983

**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
9127	3	USA/9127/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Gamma Industries
P.O. Box 2543
Baton Rouge, LA 70821

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Gamma Industries application dated May 20, 1978,
as supplemented.

c. DOCKET NUMBER

71-9127

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 Nos.: 100, 100A, 200 and 200A

(2) Description

A steel encased, uranium shielded radiographic device. The shipping containers is approximately 21 inches long, 23 inches wide and 42 inches high. The radioactive source assembly is housed in a Zircalloy or titanium "S" tube. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The gross weight of the container is 500 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing Nos. 821-1001-128, Rev. 4; 821-1001-129, Rev. 1; and 180-01, Rev. 1.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

Page 2 - Certificate No. 9127 - Revision No. 3 - Docket No. 71-9127

(2) Maximum quantity of material per package

<u>Model No.</u>	<u>Quantity</u>
100 and 100A	100 curies
200 and 200A	200 curies

6. The source shall be secured in the shielded position of the packaging by the safety plug assembly, source assembly and lockbox assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and safety plug assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The can and side plates must be a minimum of 1/4-inch thick carbon steel. The can and side plates shall be joined by full penetration welds. All other welds shall be fillet welds having sufficient throat thickness to develop strength equal to or greater than the metals being joined.
8. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: October 31, 1988.

REFERENCES

Gamma Industries application dated May 20, 1978.

Supplement dated: October 25, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9128	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/9128/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Gamma Industries P.O. Box 2543 Baton Rouge, LA 70821	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Gamma Industries application dated May 20, 1978, as supplemented.
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c. DOCKET NUMBER **71-9128**

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.: C-8

A steel encased, uranium shielded source exchanger. The shipping container is approximately 16 inches in diameter, 13 inches long and 26 inches high in its skid mounted configuration. The radioactive source assembly is housed in a Zircaloy or titanium "S" tube. A septum at the center of the "S" tube prevents moving the source assembly beyond the optimum shielding position. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The gross weight of the container is 500 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing Nos. 821-1001-033, 191, 821-1001-347, 821-1001-389, 821-1001-116, 821-1001-414, 811-1001-346, 811-1001-408, 801-1001-336, 801-1001-328, 801-1001-283, 801-1001-338, 801-1001-224 and 801-1001-159.

5. (b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

200 curies

6. The source shall be secured in the shielded position of the packaging by the safety cap, source assembly and lockbox assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the septum in the shielded position.
7. The can and side plates must be a minimum of 1/4-inch thick carbon steel. The can and side plates shall be joined by full penetration welds. All other welds shall be fillet welds having sufficient throat thickness to develop strength equal to or greater than the metals being joined.
8. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: October 31, 1988.

REFERENCES

Gamma Industries application dated May 20, 1978.

Supplement dated: October 25, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R.H. Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 06 1983

**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
9132	7	USA/9132/B(M)F	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
P.O. Box 550
Richland, WA 99352

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUPAC application dated October 20, 1978,
as supplemented.

c. DOCKET NUMBER

71-9132

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.: T-3
- (2) Description

A stainless steel and lead shielded irradiated fuel shipping package (cask). The cask is a right circular cylinder with upper and lower steel encase rigid polyurethane foam (20 lb/ft³) impact limiters. The overall dimensions are 213.2 inches in length and 52 inches in diameter. The cask without the impact limiters measures 177.2 inches in length and 26.44 inches in diameter.

The outer cask shell is comprised of a one-inch thick stainless steel shell overlaid with a ten (10) gauge stainless steel cover. Between these two materials is a 0.08-inch diameter wire wrap, providing an air gap for additional thermal protection.

The inner shell (containment vessel) is a standard seamless stainless steel Schedule 40 pipe having an outside diameter of 8.625 inches with a nominal wall thickness of 0.322 inch. The annular space between the inner and outer shells is filled with lead having a thickness of approximately eight (8) inches.

Page 2 - Certificate No. 9132 - Revision No. 7 - Docket No. 71-9132

5. (a) Packaging (continued)

Both the inner and outer shells are welded at each end to heavy steel closure plates with conical surfaces to assist in positioning and sealing. The containment vessel measures 147 inches in length by 7.981 inches in diameter.

The containment vessel is sealed at the bottom end with a 11.83-inch thick stainless steel plug with two (2) Viton O-ring seals. The top end of the containment vessel is sealed with a 11.625-inch thick stainless steel plug with two (2) Viton O-ring seals. The bottom plug is retained by a closure plate secured by eight (8), 1/2"-13UNC x 2-1/4-inch ASTM A320, Grade L7 socket head cap screws. The top plug is secured in place utilizing sixteen (16), 1/2"-13UNC x 1-3/4-inch ASTM A320, Grade L7 hex flange screws.

No drain or vents penetrate directly into the containment vessel. A drain/vent line opens directly into the area between the two (2) O-ring seals at each end of the cask (end plugs). During shipment, the lines are sealed with Viton O-ring sealed threaded fasteners.

The cask is provided with six (6) trunions, four (4) spaced 90 degrees apart at the top end and two spaced at 180 degrees apart at the bottom end of the cask. The cask is tied down at the forward and aft ends by means of a cradle and yoke assembly. The gross weight of the cask and contents is 38,000 pounds.

(3) Drawing

The packaging is constructed in accordance with Department of Energy (DOE) Drawing No. H4-61289, Sheets 1 through 4, Revision No. 6.

(b) Contents

Type, form, and maximum quantity of material per package

Irradiated mixed oxide (MOX) fuel assemblies and structural components. The minimum cooling time of each fuel assembly and rod must be 90 days and the cask may contain 1,400 thermal watts. Prior to irradiation, the MOX fuel assemblies and structural components must have the following specifications:

5. (b) Contents (continued)

	Type	Fuel Description	Array Description	Maximum Fissile Package Loading	Pin Dimensions
(1)	217-Pin FTR Driver Assembly	25% PuO ₂ -75% UO ₂ (natural uranium)	Hexagonal Array w/Pins at 0.26" center-to-center	9.0 kg	0.23" Dia 36" Active Fuel Length
(2)	109-Pin MOX Fuel Rods	35% PuO ₂ -65% UO ₂ (86% U-235)	Circular Array Individual Pins contained in 0.45" Dia Tubes	26.2 kg	0.23"-0.29" Dia 36" Active Fuel Length
(3)	40-Pin MOX Fuel Rods	35% PuO ₂ -65% UO ₂ (86% U-235)	Circular Array Individual Pins contained in 0.625"-0.88" Dia Tubes	9.6 kg	0.23"-0.29" Dia 36" Active Fuel Length
(4)	Structural Components (including control assemblies)	Dosimetry Foils ---	---	1.0 kg	---

(c) Fissile Class

I

6. Content 5(b)(1) shown in AEC Drawing Nos. H-4-21500, Rev. 9; and H-3-52461, Sheet 1, Rev. 0.

Content 5(b)(2) must be contained within inner container Ident 69 described by DOE Drawing Nos.: SK-3-23584, Sheet No. 1, Rev. 0; and H-3-52461, Sheet Nos. 1 and 2, Rev. 0.

Content 5(b)(3) must be contained within inner container Ident 1578 described by DOE Drawing Nos. SK-3-23584, Sheet No. 2, Rev. 0; and H-3-52461, Sheet Nos. 1 and 2, Rev. 0.

Page 4 - Certificate No. 9132 - Revision No. 7 - Docket No. 71-9132

7. The cask must be shipped dry (no water coolant in cask cavity). Shipment of sodium wetted fuel rods (external) is authorized for up to 200 g of sodium provided the additional requirements of Section 6.4 of the application are adhered to.
8. In addition to the requirements of Subpart G of 10 CFR Part 71, each cask prior to first use must meet the acceptance tests and criteria specified in Section 7.1 of the application. The leak test to satisfy ANSI N 14.5 and Regulatory Guide 7.4 in Section 7.1.3 of the application must be a test having sufficient sensitivity to detect a leak rate (air at standard temperature and pressure leaking to 10^{-2} atm) of 10^{-7} atm cc/sec. The results of these tests must be documented and retained for the life of the cask.
9. In addition to the requirements of Subpart G of 10 CFR Part 71, each cask must be maintained in accordance with Section 7.2 of the application.

Section 7.2.2 b) is amended to read as follows: Perform inspection of the cask lifting trunnions to ensure that no misalignment, wear, or other deformation which would significantly affect strength is present and that the inside diameter of the trunnion is no more than 0.125 inch out-of-round as defined in the submittal dated November 30, 1982. Any repair to the trunnions because of out-of-roundness or weld failure shall be authorized by NRC prior to returning the package to service.

10. The containment closure bolts (as shown on Note 9, Drawing No. H4-61289, Sheet 1), must be torqued to 70 ± 10 ft-lb.
11. The cask authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: May 31, 1985.

REFERENCES

Nuclear Packaging, Inc. application dated October 20, 1978.

Supplements dated: May 18 and September 12, 1979; January 25 and August 25, 1980; February 19 and June 16, 1981; January 28, April 13, July 23, August 19, and November 30, 1982; and July 19, September 19, and October 26, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: OCT 28 1983

**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
9133	2	USA/9133/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Gamma Industries
P.O. Box 2543
Baton Rouge, LA 70821

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Gamma Industries application dated
April 12, 1982.

71-9133

c. DOCKET NUMBER

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.: C-10

(2) Description

A steel encased, uranium shielded radiographic device. The source exchanger is approximately 7.0 inches long and 5.5 inches in diameter and provided with a 5" high steel handle (1/2" diameter). The radioactive source assembly is housed in a Zircalloy or titanium "S" tube. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The source exchanger is enclosed in a steel box 10-1/2" x 10-1/2" x 17-1/4" long with the steel handle of the source exchanger protruding. The gross weight of the package is 70 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing Nos. 637-7001-020, Rev. 2; 637-7001-033A, Rev. -; 637-7001-033B, Rev. -.

Page 2 - Certificate No. 9133 - Revision No. 2 - Docket No. 71-9133

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

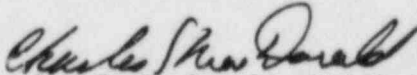
240 curies

6. The minimum depleted uranium shielding thickness must be 1-9/16 inches.
7. The source must be secured in the shielded position of the packaging by the safety cap, source assembly and lock box assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1,475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the optimum shielding position at the center of the "S" tube.
8. The name plates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
9. The packaging must be provided with a tamperproof feature which meets the requirements of 10 CFR §71.43(b).
10. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
11. Expiration date: May 31, 1987.

REFERENCE

Gamma Industries application dated April 12, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 10 1984

**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
9134	4	USA/9134/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Exxon Nuclear Idaho Company
P.O. Box 2800
Idaho Falls, ID 83401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

EG&G Idaho, Inc., Report No. PR-T-79-012,
Rev. 1, ETR Fuel Element Shipping Container,
December 2, 1982 (Addendum to PR-T-79-011
(TR-4661))

c. DOCKET NUMBER

71-9134

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.: ETR
- (2) Description

The inner container is a right parallelepiped 56-3/4 inches x 16-1/2 inches x 10-13/16 inches, constructed of 3/4-inch thick plywood, covered with 16-gauge steel. The top and bottom are lined with 1/4 inch of high density polyethylene with 0.020-inch thick cadmium plate. The spacer separating the two layers of three fuel assemblies each consists of 1-inch high density polyethylene, 1-inch of latex foam rubber, and 0.040-inch cadmium plate. Positive closure is provided by a continuous hinge and two wire sealed hinge pins provide access.

The inner container is enclosed within an overpack, 71 inches x 21-1/4 inches a 15-3/8 inches, constructed of 1-inch thick plywood, framed by steel angle members and covered with 18-gauge steel. Aluminum impact limiters (3-1/2 inches) are fixed to the ends of the overpack. Positive closure of the overpack is provided by four hinge pins which are secured in place using 1/16-inch diameter cotter pins. The package weight is approximately 690 pounds.

- (3) Drawing

The packaging is fabricated in accordance with Idaho Nuclear Corporation ETR Drawing No. E-1012, Rev. E (532-0642-47-400-021712).

Page 2 - Certificate No. 9134 - Revision No. 4 - Docket No. 71-9134

5. (b) Contents

(1) Type and Form of Material

Solid unirradiated aluminum plate type fuel element or control rod follower piece provided it contains no more than 520 grams (maximum of 300 grams/foot) of U-235 per element or follower piece.

(2) Maximum quantity of material per package

Six (6) fuel elements or control rod follower pieces (one in each compartment).

Total U-235 content not to exceed 3,120 grams per package.

(c) Fissile Class

I

6. The contents must be maintained within the respective element compartments and the active fuel lengths must be completely within the regions of the cadmium covered spacers. Wood spacers may be used to accomplish this.
7. Chemical composition of the contents must not have a hydrogen atom density, when averaged over the volume of the contents, greater than that of water at one gram per cubic centimeter.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: October 31, 1989.

REFERENCES

EG&G Idaho, Inc., Report No. PR-T-79-012, Rev. 1, December 2, 1982.

Aerojet Nuclear Company, Report No. TR-466, June 30, 1975 (Docket No. 71-9099); or, EG&G Idaho, Inc., Report No. PR-T-79-011 (TR-466 re-issued).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odgaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 09 1984

**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
9135	1	USA/9135/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Gamma Industries
P.O. Box 2543
Baton Rouge, LA 70821

Gamma Industries application dated
March 4, 1982.

c. DOCKET NUMBER

71-9135

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 Nos.: Century S, Century SA, Century Universal S, and Century Universal SA

(2) Description

A steel encased, uranium shielded radiographic device. The shipping container is approximately 7.0 inches long and 5.5 inches in diameter. The radioactive source assembly is housed in a Zircalloy or titanium "S" tube. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The packages differ from one another only in the construction and locations of the lock boxes (two types of lock boxes). The gross weight of the packages is 45 pounds.

(3) Drawings

The packagings are constructed in accordance with Gamma Industries Drawing Nos. 821-1001-439A, Rev. - (Century S&SA); and 821-1001-441A, Rev. - (Century Universal S&SA).

Page 2 - Certificate No. 9135 - Revision No. 1 - Docket No. 71-9135

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

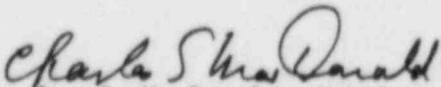
120 curies

6. The lock box assembly must be attached to the package (can) with twelve (12), 5/16"-18UNC x 1/2" long, ASTM 18-8, 304 stainless steel bolts. The minimum depleted uranium shielding thickness must be 1-9/16 inches.
7. The source must be secured in the shielded position of the packaging by the safety cap, source assembly and lock box assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1,475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the optimum shielding position at the center of the "S" tube.
8. The name plates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: April 30, 1987.

REFERENCE

Gamma Industries application dated March 4, 1982.

FOR THE U. S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9137	b. REVISION NUMBER 1	c. PACKAGE IDENTIFICATION NUMBER USA/9137/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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2. PREAMBLE
- a. This certificate is issued to certify that the packaging and contents described in Item 3 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address): Technical Operations, Inc. 40 North Avenue Burlington, MA 01803	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Technical Operations, Inc. application dated November 9, 1979.
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c. DOCKET NUMBER 71-9137

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.: 820
 - (2) Description
A steel encased, uranium shielded source changer. Primary components consist of an outer stainless steel shell, polyurethane potting material, uranium shield, eight Titanium "J" tubes, source stop, and top and bottom support plates. The contents are securely positioned within the "J" tubes by means of a source cable locking device. The package has an outside diameter of 19-1/2 inches and outside length of 21-1/2 inches. The maximum total weight of the package is approximately 222 pounds.
 - (3) Drawing
The packaging is constructed in accordance with Technical Operations, Inc. Drawing No. 82090, Sheets 1 through 4.

Page 2 - Certificate No. 9137 - Revision No. 1 - Docket No. 71-9137

5. (b) Contents

(1) Type and form of material

Iridium 192 sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

1,000 curies with no more than 240 curies in a single source.

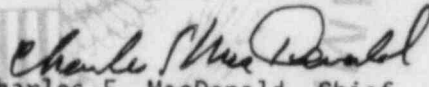
6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

7. Expiration date: January 31, 1985.

REFERENCE

Technical Operations, Inc. application dated November 9, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9139	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/9139/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company
P.O. Box 460
Pleasanton, CA 94566

General Electric Company application dated
March 24, 1980, as supplemented.

c. DOCKET NUMBER
71-9139

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.: 589

(2) Description

A steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder with 79-inch OD by 80-inch height, and a cavity 74-inch ID by 74-inch height. The 1.5-inch thick lead shield is supported by outer and inner carbon steel shells 0.75-inch and 0.375-inch thick, respectively. The bottom 1.56-inch thick lead shield is supported by outer and inner carbon steel plates 1.0-inch and 0.375-inch thick, respectively. The 1.5-inch thick lead lid shield is supported by outer and inner carbon steel plates 1-inch and 0.5-inch thick, respectively. The carbon steel used is SA516, Grade 70. The lid is attached to the cask with eight (26,000 lb proof load each) ratchet type load binders and sealed with a Buna N O-ring. The cask is equipped with a 3/4-inch drain line, sixteen-hole bolt-down flange (1-inch bolts) and two, 2-1/2-inch diameter lifting lugs. The cask lid seal and lifting lugs are protected by a wooden sacrificial impact limiter (about 8 x 10 inches thick). Gross weight of package and impact limiter, 50,000 lbs.

(3) Drawing

The packaging is constructed in accordance with PX Engineering Company, Inc., Drawing No. 589-L, Sheets 1 through 3, Revision No. 0.

Page 2 - Certificate No. 9139 - Revision No. 4 - Docket No. 71-9139

5. (b) Contents

(1) Type and form of material

Dewatered or solidified waste material in sealed secondary containers or solid irradiated hardware, meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 20,150 pounds.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring must be placed between secondary containers (or activated components) and the cask cavity to prevent movement during normal conditions of transport.

8. The lid lifting lugs must not be used for lifting the cask and must be covered in transit.

Page 3 - Certificate No. 9139 - Revision No. 4 - Docket No. 71-9139

9. The packaging acceptance tests and maintenance program must be in accordance with Section 7.0 of the application except:
 - (a) The lid O-ring seal must be replaced if inspection prior to each shipment shows any defects or every twelve (12) months, whichever occurs first.
 - (b) During inactive periods, the maintenance and testing frequency may be disregarded provided that the packaging is brought into full compliance prior to the next use of the package.
10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned to sole use of the licensee.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration Date: July 31, 1985.

REFERENCES

General Electric Application dated March 24, 1980.

Supplement dated: May 29, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odigearden

for

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**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
9141	1	USA/9141/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Technical Operations, Inc. Northwest Industrial Park Burlington, MA 01803	Technical Operations, Inc. application dated February 1, 1980.

c. DOCKET NUMBER 71-9141

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.: 900
- (2) Description

A stainless steel encased, uranium shielded radiographic device. The shipping container is 13.0 inches long, 7.7 inches high and 5.3 inches wide. The radioactive source assembly is housed inside a tungsten source tube. The source tube is surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 44.0 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos. 90090, Sheets 1, 2, 3, and 4 of 4, Rev. 0; and 90091, Sheets 1 of 1, Rev. 0.

Page 2 - Certificate No. 9141 - Revision No. 1 - Docket No. 71-9141

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

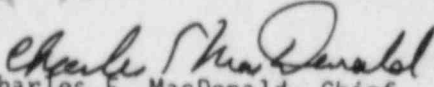
120 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.
7. The name plate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: May 31, 1985.

REFERENCE

Technical Operations, Inc. application dated February 1, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1982

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9142	2	USA/9142/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Monsanto Research Corporation
P.O. Box 8, Station B
Dayton, OH 45407

Monsanto Research Corporation application
dated March 5, 1980.

71-9142

c. DOCKET NUMBER

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.: MRC-20WC

(2) Description

Packaging as described and constructed in accordance with DOT Specification 20WC.

(b) Contents

(1) Type and form of material

Plutonium 238 sources in excess of twenty (20) curies per package must be at least double encapsulated in a metal capsule such that the sources meet the requirements of special form radioactive material.

Inner and outer capsules are individually leak tested during fabrication per ANSI N542-1977, procedure A2.2.3 (He pressure bubble test), or equivalent. Prior to shipment, the outer capsule will be smear tested per ANSI N542-1977, per A2.1.1 except that the wipe will not be moistened with solvent. If the wipe shows less than 10 pci removable contamination, the source may be delivered to a carrier for transport.

(2) Maximum quantity of material per package

Six (6) grams of Pu-238 (100 ci).

Page 2 - Certificate No. 9142 - Revision No. 2 - Docket No. 71-9142

- 6. Sources must be packaged to minimize possibility of secondary impacts due to accident conditions of transport.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: April 30, 1987.

REFERENCE

Monsanto Research Corporation application dated March 5, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

**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
9143	1	USA/9143/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Technical Operations, Inc. application dated
August 1, 1980.

c. DOCKET NUMBER

71-9143

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.: 920

(2) Description

A stainless steel encased, uranium shielded radiographic device. The shipping container is 13.0 inches long, 7.7 inches high and 5.3 inches wide. The radioactive source assembly is housed inside a tungsten source tube. The source tube is surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 47.0 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos. 92090, Sheets 1, 2, and 3 of 3, Rev. 0; 90090, Sheets 3, and 4 of 4, Rev. 0; and 90091, Sheet 1 of 1, Rev. A.

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.
7. The name plate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: February 28, 1986.

REFERENCE

Technical Operations, Inc. application dated August 1, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9144	b. REVISION NUMBER 1	c. PACKAGE IDENTIFICATION NUMBER USA/9144/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc.
240 Stoneridge Drive
Columbia, SC 29210

Chem-Nuclear Systems, Inc. application dated
January 19, 1981, as supplemented.

c. DOCKET NUMBER

71-9144

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 Nos.: SGC-1

(2) Description

A steel shipping container for shipment of the lower assembly of a steam generator. The external dimensions of the packaging are 42'6" length and ranging in diameter from 13'5" to 15'7". The packaging consists of a cylindrical section rolled from 2.5" thick steel plate with 2.75" thick end plates. The packaging is flanged down the center of the cylinder and sealed with a Neoprene gasket and 112, two-inch bolts on 12-inch centers. The lower shell assembly has two external saddle base support assemblies. The packaging is provided with two drain plugs. The packaging weight is 276,000 pounds and the gross weight is 722,000 pounds.

The top and bottom openings are sealed with 3 to 5-inch thick steel plate welded to the steam generator. All other openings are sealed with 2" thick (minimum) plate or bar steel and welded closed.

(3) Drawing

The packaging is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing Nos. 110-2700-E01, Revision A; 110-2700-E02, Sheet Nos. 1 thru 3, Revision A; 110-2700-E03, Revision A; 112-2700-E01, Revision A; and 115-0127-D01, Revision A.

Page 2 - Certificate No. 9144 - Revision No. 1 - Docket No. 71-9144

5. (b) Contents

(1) Type and form of material

Steam generator lower assembly containing radioactive material adhering to the inside of the tube surfaces.

(2) Maximum quantity of material per package

750 ci of principally corrosion products, mainly Co-60.

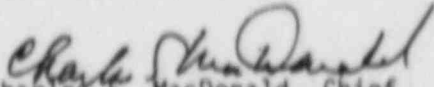
6. The steam generator lower assembly must be sealed in accordance with Figures 1.2-3, Rev. 2 and 1.2-5, Rev. 1 (pp 1-10 and 1-11). The exterior surface of the steam generator lower assembly must be decontaminated to no more than 220 dpm/100 cm².
7. In lieu of meeting the requirements of 10 CFR §§71.45(b), 71.71, (Free Drop), and 71.73.
- a. An escort must be provided during land transport which is knowledgeable in the use of radiation survey instrument, be equipped with an appropriate survey instrument, supplies to permit the establishment of a radiation exclusion area, and be provided with written procedures to be followed in an emergency situation.
- b. Appropriate means must be taken to control the maximum land speed to 10 mph. On curves and grades, the maximum land speed must be limited to 5 mph.
8. The lifting devices must be securely covered during transport to prevent their use during transport as a tie-down device or for lifting the loaded package.
9. The package authorized by this certificate must be transported on a vehicle, inland water craft, or barge assigned for sole use of the licensee.
10. The package authorized for use by this certificate is hereby approved for use under license provision of 10 CFR §71.12.
11. Expiration date: April 30, 1986.

REFERENCES

Chem-Nuclear Systems, Inc. application dated January 19, 1981.

Supplements dated: March 31, and April 21, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety

Date: SEP 06 1983

502

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9145	4	USA/9145/A	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUPAC application dated September 19, 1980,
as supplemented.

c. DOCKET NUMBER

71-9130

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 Nos.: NUPAC 50-1.5L, NUPAC 50-2.5L, NUPAC 50-3.0L, and NUPAC 50-4.0L

(2) Description

A steel encased lead shielded casks for low specific activity material. The casks are right circular cylinder with a 48.5-inch inside diameter by 52.5-inch inside high cavity. The walls of the casks contain a lead thickness ranging from 1.25 to 3.75 inches encased in 3/8-inch thick steel shell. The bottom and top covers of the cask are made up of two, steel plates ranging in thickness from 1.00 to 3.00 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-inch ratchet binders. A secondary cask lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The cask is provided with four equally spaced lifting/tie down devices. Casks gross weights range from 13,200 to 28,900 pounds.

(3) Drawing

The packagings are fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-2010, Sheets 1 and 2, Revision C.

Page 2 - Certificate No. 9145 - Revision No. 4 - Docket No. 71-9145

(b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring shall be placed between secondary containers (or activated components) and the cask cavity to prevent movement during normal conditions of transport.
8. Prior to each shipment, the packaging lid seals shall be inspected. The seals shall be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.

Page 3 - Certificate No. 9145 - Revision No. 4 - Docket No. 71-9145

9. The package authorized by this certificate shall be transported on a vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.
10. Lid lifting devices shall be covered prior to transport to prevent its use as tie-down devices.
11. The cask body and each cask lid shall be marked in accordance with 10 CFR §71.85(c).
12. The package authorized for use by this certificate is hereby approved for use under license provision of 10 CFR §71.12.
13. Expiration date: February 28, 1986.

REFERENCES

Nuclear Packaging, Inc, application dated September 19, 1980.

Supplements dated: December 12 and 18, 1980; and August 25, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RJ Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

JUL 12 1984

**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
9147	1	USA/9147/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803

Technical Operations, Inc. application dated
October 30, 1980.

c. DOCKET NUMBER

71-9147

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.: 850
- (2) Description

A stainless steel encased, uranium shielded source changer. The shipping container is 8.8 inches long, 10.4 inches high and 8.5 inches wide. The radioactive source assemblies are housed inside titanium source tubes. The source tubes are surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 77.0 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos. 85090, Sheets 1, 2, 3, 4, and 5 of 5, Rev. 0 and 90091, Sheet 1 of 1, Rev. A.

Page 2 - Certificate No. 9147 - Revision No. 1 - Docket No. 71-9147

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

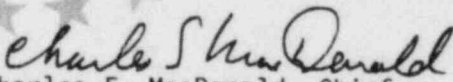
240 curies

6. The sources must be secured in the shielded position of the packaging by the source assemblies. The source assemblies must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assemblies must engage the locking device. The source assemblies must be of sufficient length and diameter to provide positive positioning of the sources within the depleted uranium shield assembly.
7. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: January 31, 1986.

REFERENCE

Technical Operations, Inc. application dated October 30, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
9148	1	USA/9148/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803

Technical Operations, Inc. application dated
March 24, 1981, as supplemented

c. DOCKET NUMBER 71-9148

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.: 770
- (2) Description

The Model No. 770 shipping container is designed for use as a source changer, storage container, and Type B shipping container for radiographic sources in special form. The Model No. 770 source changer measures 23 inches long, 24 inches wide, and 20 inches high. The radioactive source assembly is housed in Zircalloy or titanium "S" tube. The "S" tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in two steel containers. The void space between the depleted uranium shield assembly and the inner container is filled with a rigid polyurethane foam. The gross weight of the container is 813 pounds.

Page 2 - Certificate No. 9148 - Revision No. 1 - Docket No. 71-9148

(3) Drawing

The packaging is constructed in accordance with Technical Operations, Inc. Drawing No. 77090 - Sheet 1, Rev. 1; Sheet 2, Rev. 2; and Sheets 3 through 6, Rev. 1.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

550 curies

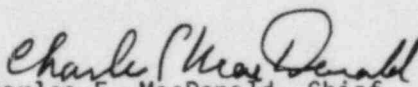
6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. Name plates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The lifting eye bolts (2) must be removed prior to shipment and the holes covered to prevent their use as a tie-down device during transport.
9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: May 31, 1987.

REFERENCES

Technical Operations, Inc. application dated March 24, 1981.

Supplement dated: January 18, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9149	1	USA/9149/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803

Technical Operations, Inc. application dated
April 10, 1981.

c. DOCKET NUMBER

71-9149

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.: 910

(2) Description

A stainless steel encased, uranium shielded radiographic device. The shipping container is 13.0 inches long, 7.7 inches high and 5.3 inches wide. The radioactive source assembly is housed inside a tungsten source tube. The source tube is surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 34.0 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos. 91090, Sheets 1, 2, and 3 of 3, Rev. 0 and 90090, Sheets 3 and 4 of 4, Rev. 0.

Page 2 - Certificate No. 9149 - Revision No. 1 - Docket No. 71-9149

5. (b) Contents

(1) Type and form of Material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

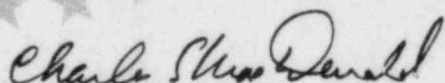
30 curies

6. The source must be secured in the shield position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.
7. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: June 30, 1986.

REFERENCE

Technical Operations, Inc. application dated April 10, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 10 1983

**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
9150	2	USA/9150/B(U)	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Sandia National Laboratories
Albuquerque, NM 87185

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

PAT-2 (Plutonium Air-Transportable Model 2)
Safety Analysis Report, SAND81-0001, printed
July 1981, as supplemented.

c. DOCKET NUMBER

71-9150

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.: PAT-2

(2) Description

A superalloy primary containment vessel (TB-2) surrounded by a protective overpack (AQ2). The contents which may be in canisters are contained within a capsule (C-1) within the TB-2.

The AQ-2 overpack is a right circular cylinder, approximately 356 mm (14 inches) high and 381 mm (15 inches) in diameter with protruding handles attached to the cylinder outer walls. The outer shell is a double walled stainless steel structure with rounded end caps, riveted on the bottom and bolted at top. An inner grain oriented maple wood protective case houses the TB-2; it is surrounded by a titanium load spreader which is further surrounded by a grain oriented redwood protective case.

Page 2 - Certificate No. 9150 - Revision No. 2 - Docket No. 71-9150

The TB-2 containment vessel consists of (2) iron-base superalloy sections, bolted together with (20) bolts, forming an 88 mm (3.46 inch) diameter sphere. A copper gasket held between knife-edge sealing beads on the matting hemispherical surfaces of the TB-2 provides a seal.

The C-1 capsule is a stainless steel cylinder with a nominal 44 mm (1.80 inch) diameter and a nominal 70 mm (2.76 inch) length; it has a screw top lid which is sealed with teflon tape.

Brass or aluminum canisters may be used in the C-1 capsule to hold various radioactive contents. The canisters may have quartz or glass liners.

The package gross weight is approximately 73 pounds (33 kg).

(3) Drawings and Specifications

The packaging is constructed in accordance with specifications and drawings, as listed by document number, issue, and title in the List of Data LD-T67000-000, page 1, issue D and page 2, issue D (Chapter 9 of Safety Analysis Report, SAND81-0001, printed July 1981).

(b) Contents

(1) Type and form of material

Plutonium, uranium, or mixtures of plutonium-uranium in various isotopic compositions in solid form as:

- (i) oxide powder, sintered oxide pellets, and metal;
- (ii) plutonium sulfate tetrahydrate, $\text{Pu}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ and plutonium nitrate dihydrate, $\text{Pu}(\text{NO}_3)_4 \cdot 2\text{H}_2\text{O}$.

(2) Maximum quantity of material per package

- (i) For the contents described in 5(b)(1)(i):

Not to exceed 15 grams fissile material, 120 grams mass, 2 watts decay heat, or 0.5 gram water.

- (ii) For the contents described in 5(b)(1)(ii):

Not to exceed 3 grams or 0.5 grams water in addition to the water of hydration.

Page 3 - Certificate No. 9150 - Revision No. 2 - Docket No. 71-9150

6. Up to 9 grams of polyvinylchloride (PVC), 18 grams of quartz (SiO_2) or glass, 50 grams of brass, and 16 grams of aluminum may be used within the C-1 capsule for packaging of contents. Up to 0.3 gram of polytetra-fluoroethylene (PTFE) tape may be used to seal the C-1 capsule.
7. The C-1 capsule need not be leak tested when the activity of plutonium contents does not exceed 20 ci per package.
8. A maximum of 2.0 grams of aluminum foil may be used to shim the C-1 within the TB-2 to avoid relative movement between the two.
9. Prior to first use, each package must meet the criteria for the acceptance tests specified in section 8.1 of Chapter 8 of the Safety Analysis Report (SAND81-0001, printed July 1981).
10. Prior to each shipment, the package must meet the criteria for inspections and tests specified in section 8.2 of Chapter 8 of the Safety Analysis Report (SAND81-0001, printed July 1981).
11. Periodic testing and maintenance of the package must be in accordance with section 8.3 of Chapter 8 of the Safety Analysis Report (SAND81-0001, printed July 1981).
12. Operating procedures must be in accordance with Chapter 7 of the Safety Analysis Report (SAND81-0001, printed July 1981).
13. Through special arrangement with the carrier, the shipper shall ensure observance of the following operational controls for each shipment of plutonium by air:
 - (a) The package(s) must be stowed aboard aircraft on the main deck in the aft-most location that is possible for cargo of its size and weight. No other type of cargo may be stowed aft of the package(s).
 - (b) As an alternative to (a), packages must be stowed in the aft-most lower cargo compartment. No other type of cargo may be stowed aft of the package(s).
 - (c) Package(s) must be secured and restrained to prevent shifting under normal transport.
 - (d) Cargo which bears the "EXPLOSIVE A" label may not be transported aboard an aircraft carrying a PAT-2 package(s).

Page 4 - Certificate No. 9150 - Revision No. 2 - Docket No. 71-9150

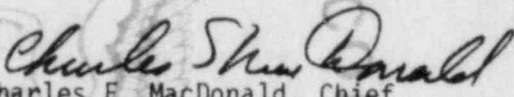
14. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
15. The package authorized by this certificate is hereby approved for transportation of plutonium by air.
16. Expiration date: September 30, 1986.

REFERENCE

PAT-2 (Plutonium Air-Transportable Model 2) Safety Analysis Report, SANDIA Report No. SAND81-0001, July 1981.

DOE application dated April 19, 1983, supplement dated August 3, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 31 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9151	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/9151/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 4
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Westinghouse Hittman Nuclear Incorporated 9151 Rumsey Road Columbia, MD 21045	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Hittman Nuclear & Development Corporation, application dated April 5, 1982, as supplemented.
c. DOCKET NUMBER 71-9151	

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 Nos.: HN-100 Series 3, CNS 14-170 Series III, and NUS 14-170 Series 1

(2) Description

Steel encased, lead shielded casks for low specific activity material. The casks are right circular cylinders 81-1/2 inches high by 81-3/4 (or 81-1/2) inches in diameter. The cask cavities are 73-3/8 inches high by 75-1/2 inches in diameter. The cask side walls consists of a 3/8-inch thick inner steel shell, a 1-7/8-(or 1-3/4-)inch lead shell, and a 7/8-inch thick outer steel shell. The base is comprised of two, 2-inch thick steel plates welded together to form a 4-inch thick base which is integrally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is comprised of two, 2-inch thick steel plates, which are stepped and welded together to mate with the steel flange. The cask closure is sealed by a Neoprene gasket located between the lid and steel flange, positive closure of the lid is accomplished by eight, 1-3/4-inch ratchet binders. The lid contains a centrally located shield plug comprised of two, 2-inch thick steel plates and one, 1-inch thick steel plate stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nuts are used to provide positive closure. The packagings are constructed of A-516, Grade 70, carbon steel. The outer shell will have a minimum yield strength of 46,000 psi.

<u>Model Number</u>	<u>OD, inches</u>	<u>Lead Tk, inches</u>
HN-100 Series 3	81-3/4	1-7/8
CNS 14-170 Series III	81-1/2	1-3/4
NUS 14-170 Series 1	81-3/4	1-7/8

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5.(a) (2) Description (continued)

Tie-down is accomplished by four tie-down lugs welded to the cask body. There are four cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 53,005 pounds.

(3) Drawings

The packagings are fabricated in accordance with Hittman Nuclear & Development Corp. Drawing Nos.: C001-5-9138, Rev. 7; C001-5-9139, Rev. 4; C001-5-9140, Rev. 5; C001-5-9141, Rev. 2; C001-5-9142, Rev. 1; C001-5-9143, Rev. 5; and C001-5-9144, Rev. 3. Optional stainless steel shielding insert in accordance with Drawing Nos.: STD-02-035, Rev. 1; STD-02-036, Rev. 1; and STD-02-037, Rev. 2.

The Model No. CNS 14-170 Series III has one or more of the options shown in Chem-Nuclear Systems, Inc. Drawing No. C-110-D-0006, Rev. A.

The Model No. NUS 14-170 Series I is fabricated in accordance with NUS Corporation Drawing Nos.: 8916 M 2001, Rev. B; 8916 M 2002, Rev. B; 8916 M 2003, Rev. B; 8916 M 2004, Rev. A; and 8916 M 2005, Rev. A.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material, sealed in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents, optional shield insert, and secondary containers shall not exceed 19,205 pounds. When the shield insert is not installed in the cask, the internal decay heat load shall not exceed 7 watts. When the shield insert is installed in the cask, the internal decay heat load shall not exceed 28 watts.

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6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
7. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.
8. The lid, shield plug, and cask lifting lugs must be covered in transit to preclude their use as tie-down devices.
9. In addition to the requirements of Subpart G of 10 CFR Part 71:
- (i) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.
 - (ii) Each package must meet the Acceptance Tests and Maintenance Program of Section 7.0 and Appendix E of the application. Gamma scan for the shielding acceptance may be based on lead equivalence for lead and steel with all readings within 2.3 inches +10% on a 4-inch grid. The Model No. NUS 14-170 Series 1 package must meet the Acceptance and Maintenance Programs of NUS Procedures WM-011, WM-012, WM-013, and WM-014.

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10. Paragraph 8.1 and Figure 1 of Hittman Nuclear & Development Corporation Procedure No. HNDC-0-001-2/3, Rev. 7 (Hittman ltr dtd April 27, 1983) are deleted. Seals which show any visual defects (cracking, gouging, tearing, etc.) must be repaired in accordance with the referenced procedure and Note No. 3 on Hittman Drawing No. C001-5-9138, Rev. 7; NUS Procedure WM-012, Section 7.1; or, replaced with a new seal.
11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
13. Expiration date: June 30, 1987.

REFERENCES

Hittman Nuclear & Development Corporation application dated April 5, 1982.

Supplements dated: April 22 and June 17, 1982; February 3, April 27, and April 29, 1983; and June 13, 1984 (WHNI-E-785).

Chem-Nuclear Systems, Inc. supplement dated: November 16, 1982.

NUS Process Services Supplements dated: June 29 and September 12, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9152	b. REVISION NUMBER 6	c. PACKAGE IDENTIFICATION NUMBER USA/9152/B()	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address): Chem-Nuclear Systems, Inc. 220 Stoneridge Drive Columbia, SC 29210	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Chem-Nuclear Systems, Inc. application dated June 18, 1981, as supplemented.
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c. DOCKET NUMBER 71-9152

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.: CNS 1-13C II
 - (2) Description

A shipping cask for radioactive waste. The packaging consists of a double-walled steel circular cylinder separated by 16-gauge wires, 39-1/8" in diameter and 68-1/2" high with a central steel lined cavity 26-1/2" in diameter and 54-1/16" high, approximately 5" of lead surrounds the central cavity. Closure is accomplished by a steel, plug type, lead filled cover secured by twelve (12), 1-1/4" bolts and seal provided by a flat silicone rubber gasket and a silicone rubber O-ring with a sealed 3/8" test port between the gaskets. Approximately 6" lead are in the base and cover. The cask is equipped with a cavity drain line sealed with a 3/8" cap screw and gasket, a steel lifting hook for the cover, and top and bottom impact limiters filled with 16.5 lb/cu ft rigid polyurethane foam clad in steel. The impact limiters are attached to the cask by six (6), 1" ratchet binders. The overall dimensions with impact limiters is 60" in diameter and 99-5/8" high. The package gross weight is approximately 27,000 lbs.
 - (3) Drawing

The packaging is constructed in accordance with Chem-Nuclear Systems, Inc., Drawing No. E-1-436-111, Sheets 1 and 2, Rev. D.

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5. (b) Contents

(1) Type and form of material

- (i) Greater than Type A quantity of nonfissile radioactive material as solidified or dewatered process solids (resins) within a sealed secondary container; or
- (ii) Greater than Type A quantity of irradiated solid reactor components within a sealed secondary container.

(2) Maximum quantity of material per package

For the contents described in 5(b)(1)(i) and (ii):

Not to exceed a decay heat generation of 800 watts and 3,000 pounds including weight of the contents and secondary container; and

For the contents described in 5(b)(1)(i):

Residual water in the secondary container not to exceed the activity stated in Table 4.5.2-1 of the application.

- 6. As needed, appropriate shoring must be used in the cask cavity to limit movement of the secondary container during accident condition of transport.
- 7. The cask cover must be secured by twelve (12), SA-354, Type BD, 1-1/4"-7UNC x 2-1/4" long bolts torqued to 270 ft-lbs \pm 10% (lubricated) or 360 ft-lbs \pm 10% (dry).
- 8. Prior to each shipment, the leak tests described in Appendix 8B of the application must be performed. No package is to be delivered to a carrier for transport with a detectable leak using the method of Appendix 8B.
- 9. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
 - (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

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9. (Continued)

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

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

- (i) Each package must meet the acceptance tests and be maintained in accordance with the Maintenance Program of Section 8 of the application.

Alternatively, the leak tests described in Appendixes 8-A and 8-B of the application may be performed in accordance with EG&G Idaho, Inc. letter dated December 20, 1982. Maintenance and repair records shall be furnished to the packaging owner.

- (ii) The O-ring must be replaced quarterly with new seals. The flat lid gasket must be replaced annually. The test port and drain line seals must be replaced before each loaded shipment.

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

12. Expiration date: March 31, 1987.

REFERENCES

Chem-Nuclear Systems, Inc. application dated June 18, 1981.

Supplements dated: September 30 and December 31, 1981; and April 1, 1982.

EG&G Idaho, Inc. supplement dated: December 20, 1982.

Department of Energy supplement dated: September 7, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Osgaarden

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 05 1984

**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
9153	2	USA/9153/B()	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Teledyne Energy Systems
110 West Timonium Road
Timonium, MD 21093

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Teledyne Energy Systems application
dated October 5, 1981, as supplemented.

c. DOCKET NUMBER

71-9153

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.: SENTINEL 1S
- (2) Description

The packaging contains a thermoelectric generator with 10,100 ci of strontium 90 fluoride. The dimensions are 32.2 inches in height by 37.53 inches in diameter. The package is welded to a 39.5 inch square, steel pallet, which is 4 inches high.

The contents are housed in a Hastelloy C-276 liner. The liner, with its pressed cap, is contained within a fuel capsule (1.871" OD x 4.194"). The capsule lid is threaded for strength and welded (minimum weld penetration of 0.055" is specified) to give a positive seal. The wall thickness of the capsule is a minimum of 0.198 inches. The fuel capsule is constructed of Hastelloy C-276. The capsule is inserted into the stainless steel canned depleted uranium biological shield (1.898" ID x 4.320" OD x 5.885" or 5.978"), and the shield plug is bolted into place using three steel bolts, equally spaced on a 3.25-inch bolt circle.

The biological shield is held in a horizontal position within the generator's aluminum housing by the sized Min-K-1301 thermal insulation. Min-K and load bearing plates are used to support the shield base. Spring washers are used to preload the Min-K supporting the biological shield.

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(2) Description (continued)

The finned (13" OD x 14.5") aluminum housing (7" OD x 8.97") forms the outer protective shell of the generator (70 lbs). The generator is held in place within the cask by a hold down assembly with a rubber pad on top and a 2-inch thick (1/8"-0.001" core) aluminum honeycomb with a 97 square inch effective area, on the bottom. The total system weight is approximately 7,190 pounds.

(3) Drawings

The packaging is constructed in accordance with Teledyne Energy Systems Drawing Nos.: 013-01000, Rev. 0; 013-01001, Rev. 0; 013-01002, Sheets 1 and 2, Rev. 0; and assembled in accordance with Figure 2.7-1, p 3-17 of the application.

(b) Contents

(1) Type and form of material

Strontium fluoride ($^{90}\text{SrF}_2$) doubly encapsulated in a Hastelloy C-276 fuel capsule, with a Hastelloy C-276 liner which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

12,000 curies.

6. The lifting rings must be either removed, securely covered, or locked during transport to prevent their use as tie-down devices.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.12.
8. Expiration date: October 31, 1986. ★ ★ ★ ★

REFERENCES

Teledyne Energy Systems application dated October 5, 1981.

Supplements dated: October 21 and November 30, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 08 1983

U.S. NUCLEAR REGULATORY COMMISSION

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9154	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9154/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): U.S. Department of Energy 1333 Broadway Oakland, CA 94612	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Technical Operations, Inc. application dated October 27, 1981.
c. DOCKET NUMBER 71-9154	

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.: 858
- (2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell (21" x 12" x 14.62"), internal bracing, polyurethane potting material, depleted uranium shield (4.0" min. thickness), and a Zircalloy "S" tube (0.467" OD x 0.385" ID). The contents are securely positioned in the Zircalloy "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 502 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos.:

- 85890, Sheets 1, 2, 3, 4, 5, and 6 of 6, Rev. 0
- 66025, Sheets 2 and 3 of 3, Rev. A.

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5. (b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

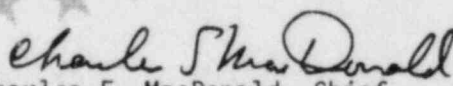
110 curies

6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The nameplates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: November 30, 1986.

REFERENCE

Technical Operations, Inc. application dated October 29, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9156	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9156/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Industrial Nuclear Company
1124 Chess Drive
Foster City, CA 94404

Industrial Nuclear Company application dated
December 23, 1981, as supplemented.

c. DOCKET NUMBER

71-9156

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.: IR-50
- (2) Description

The Model No. IR-50 shipping container is designed for use as a source changer, storage container, and Type B shipping container for radiographic sources in special form. The Model No. IR-50 source changer measures 8.875 inches long, 4.5 inches wide, and 8.5 inches high. The radioactive source assembly is housed in Zircalloy or titanium "S" tube. The "S" tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the depleted uranium shield assembly and the inner container is filled with a rigid polyurethane foam. The 45 pound source changer is centered by plywood supports within a 10 gallon (min 20 gauge) steel drum with a 12-gauge steel closure ring. The gross weight of the source changer and overpack is 70 pounds.

Page 2 - Certificate No. 9156 - Revision No. 2 - Docket No. 71-9156

(3) Drawings

The packaging is constructed in accordance with Industrial Nuclear Company Drawing Nos. 2A, Rev. -; 50-4, Rev. -; and 50-4(A), Rev. -.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

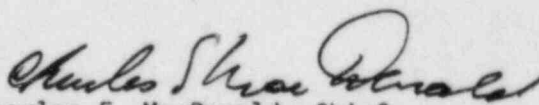
6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. Name plates on overpack must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility. The two vent holes in the side of the overpack must be covered with tape or rubber (plastic) plugs to prevent entry of rain water.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: July 31, 1987.

★ REFERENCES ★

Industrial Nuclear Company application dated December 23, 1981.

Supplements dated: May 28, 1982; and October 13, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 26 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9157	b. REVISION NUMBER 3	c. PACKAGE IDENTIFICATION NUMBER USA/9157/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Industrial Nuclear Company
1124 Chess Drive
Foster City, CA 94404

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Industrial Nuclear Company application dated
December 23, 1981, as supplemented.

71-9157

c. DOCKET NUMBER

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.: IR-100

(2) Description

The Model No. IR-100 exposure device is designed for use as an exposure device, storage container, and Type B shipping container for radiographic sources in special form. The Model No. IR-100 exposure device measures 8.875 inches long, 4.5 inches wide, and 8.5 inches high. The radioactive source assembly is housed in Zircalloy or titanium "S" tube. The "S" tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the depleted uranium shield assembly and the inner container is filled with a rigid polyurethane foam. The gross weight of the exposure device is 45 pounds.

Page 2 - Certificate No. 9157 - Revision No. 3 - Docket No. 71-9157

(3) Drawings

The packaging is constructed in accordance with Industrial Nuclear Company Drawing No. 1A, Rev. -

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.
7. The name plate on the exposure device must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.
9. Expiration date: July 31, 1987.

REFERENCES

Industrial Nuclear Company application dated December 23, 1981.

Supplements dated: May 28, 1982; and October 13, 1983 (two letters).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 27 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9159	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9159/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Nuclear Packaging, Inc., 1010 South 336th Street, Federal Way, WA 98003	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: NUPAC application dated October 29, 1982, as supplemented.
c. DOCUMENT NUMBER 71-9159	

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 Nos.: NUPAC 14/190L, NUPAC 14/190M, and NUPAC 14/190H
- (2) Description
- Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 75.5-inch ID by 73.38-inch IH cavity. The walls of the casks contain a lead thickness ranging from 1.25 to 2.63 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch ratchet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12 gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The casks gross weights range from 49,200 to 65,200 pounds.
- | Model Number | OD, inches | Lead Tk, inches | Top Tk, inches | Bottom Tk, inches | Gross Wt, pounds |
|---------------|------------|-----------------|----------------|-------------------|------------------|
| NUPAC 14/190L | 80.5 | 1.25 | 4.0 | 4.0 | 49,200 |
| NUPAC 14/190M | 81.5 | 1.75 | 4.0 | 4.0 | 53,500 |
| NUPAC 14/190H | 83.25 | 2.63 | 5.0 | 5.0 | 65,200 |

(3) Drawing

The packages are fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-204D, Sheets 1 and 2, Revision No. D.

(b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 7 watts for the Model Nos. NUPAC 14/190L and NUPAC 14/190M casks and 25 watts for the Model No. NUPAC 14/190H cask.

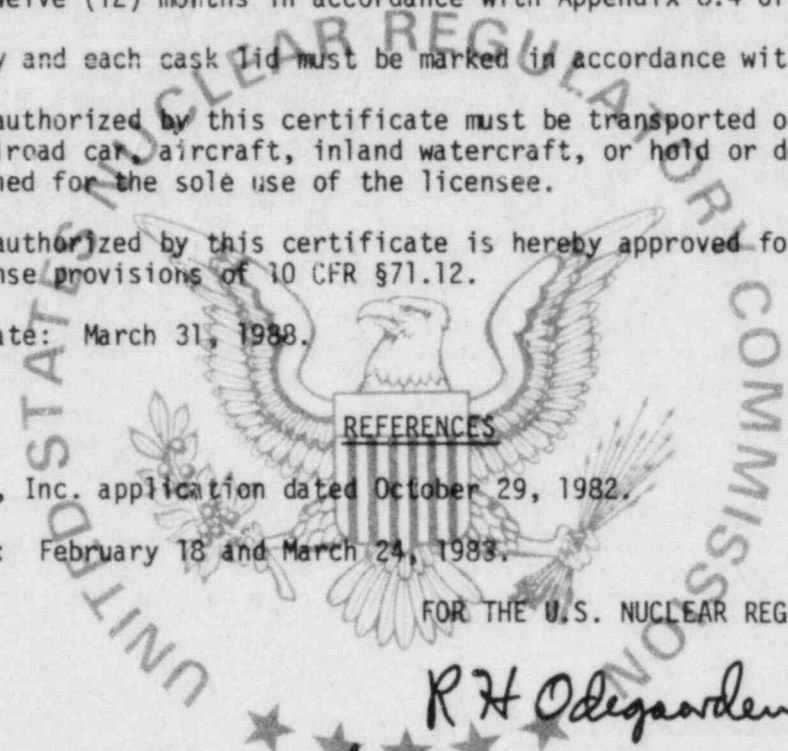
6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.
7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 20,000 pounds.
8. Except for close fitting contents, shoring shall be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.
9. The lid and shield plug lifting lugs shall not be used for lifting the cask, and shall be covered in transit.
10. The cask shall be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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11. In addition to the requirements of Subpart G of 10 CFR Part 71:
- (i) Prior to each shipment, the packaging Neoprene lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain and vent lines shall be sealed with appropriate sealant applied to the pipe plug threads.
 - (ii) Each cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask must be leak tested at least every twelve (12) months in accordance with Appendix 8.4 of the application.
12. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).
13. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
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: March 31, 1988.



REFERENCES

Nuclear Packaging, Inc. application dated October 29, 1982.

Supplements dated: February 18 and March 24, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9160	b. REVISION NUMBER 0	c. PACKAGE IDENTIFICATION NUMBER USA/9160/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

**Gulf Nuclear, Inc.
202 Medical Center Boulevard
Webster, TX 77598**

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

**Gulf Nuclear, Inc. application dated
January 21, 1984, as supplemented.**

c. DOCKET NUMBER **71-9160**

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 Nos.: 20-VS and 40-VS
- (2) Description

Radiographic devices and shipping container for sealed sources. The packages are approximately 12" high x 6" wide x 8" long. The outer case is constructed of 15 gauge 303 stainless steel. The package is provided with a 0.76" diameter handle. The 34 pound uranium shield is held in place by potting epoxy and 2 brackets within the case. The sealed source is held within a Zircaloy or titanium S-tube by a lockblock assembly and a safety plug assembly at the opposite end of the S-tube. The Model Nos. 20-VS and 40-VS are identical except for shielding capability of the uranium shield. The package weighs 42 pounds.

(3) Drawings

The package is constructed in accordance with Gulf Nuclear, Inc. Drawing Nos. A-31, Sheets 3 and 4, Rev. 1; A-31-1, Sheets 1 and 2, Rev. 0; A-3-1, Rev. 1; A-31-12, Rev. 0; A-31-16, Rev. 1; A-31-18, Rev. 1; A-31-20, Rev. 1; A-31-21, Sheets 1, 2, and 3, Rev. 1; A-31-31, Sheets 1, 2, and 3, Rev. 1; A-31-32, Rev. 0; A-31-34, Sheet 3, Rev. 1 and Sheet 4, Rev. 0; 1000-50-14, Rev. 0; and 1000-50-13, Rev. 0.

Page 2 - Certificate No. 9160 - Revision No. 0 - Docket No. 71-9160

(b) Contents

(1) Type and form of material

Iridium 192 sealed source which must be shown to meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

One source containing:

(i) Model No. 20-VS package - 120 Ci; or

(ii) Model No. 40-VS package - 220 Ci.

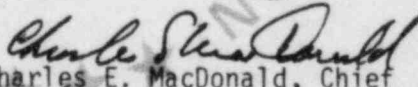
6. The package model designation must be determined by the Initial Acceptance criteria given in Section 5.3 (p 5-3) of the application.
7. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: April 30, 1989.

REFERENCES

Gulf Nuclear, Inc. application dated January 21, 1984.

Supplements dated: March 6 and 20, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 10 1984

**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
9163	1	USA/9163/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Gulf Nuclear, Inc.
202 Medical Center Boulevard
Webster, TX 77598

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Gulf Nuclear, Inc. application dated
April 28, 1983, as supplemented.

c. DOCKET NUMBER

71-9163

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.: GNG-20
- (2) Description

A right circular cylinder shipping container for a sealed source. The container is constructed of ten gauge steel 20-inch OD by 20-inch high. The packaging cavity (insert) is provided with a female thread to accept a source that screws into the bottom of the cavity. The cavity is also provided with an insert plug and a rubber gasketed door which is sealed and secured with both a lock pin and a padlock. The packaging and insert plug are filled with a 60-40 weight percent of hydrated boric acid and polyester resin weighing approximately 11 pounds/gallon. The gross weight of the package is 300 pounds.

(3) Drawings

The packaging is constructed in accordance with Gulf Nuclear, Inc. Drawing Nos. R-11G, Rev. 2; NS-GH20-A, Rev. 2; NS-GH20-B, Rev. 2; NS-GH20-C, Rev. 2; NS-GH20, Rev. 2; and A-125, Rev. 2.

Page 2 - Certificate No. 9163 - Revision No. 1 - Docket No. 71-9163

5. (b) Contents

(1) Type and form of material

Americium 241/Beryllium neutron source (Gulf Nuclear, Inc. Model No. 71-2A source) which must be shown to meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

One source containing 20 curies.

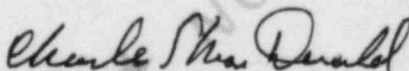
6. The source must be screwed into the cavity (insert) hand tight plus 1/4 turn.
7. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: June 30, 1988.

REFERENCES

Gulf Nuclear, Inc. application dated April 28, 1983.

Supplement dated: June 3, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation certification Branch
Division of Fuel Cycle
and Material Safety, NMSS

Date: _____

SEP 06 1983

**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
9165	0	USA/9165/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc.
40 North Avenue
Burlington, MA 01803

Technical Operations, Inc. application dated
May 21, 1982, as supplemented.

71-9165

c. DOCKET NUMBER

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.: 855
- (2) Description

A steel encased, uranium shielded source changer. Primary components consist of an outer carbon steel shell, rigid polyurethane potting material, uranium shield, eight Titanium "J" tubes, source stop, top and bottom support plates and a gasketed lid which is secured with eight, 3/8"-16 UNC x 5/8" long hex head bolts. The contents are secured positioned within the "J" tubes by means of a source cable locking device. The package has an outside diameter of 11.25 inches and outside height of 14.75 inches which includes the lid eyebolt. The maximum total weight of the package is approximately 195 pounds.

(3) Drawing

The packaging is constructed in accordance with Technical Operations, Inc. Drawing No. 85590: Sheet No. 1, Rev. 1; Sheet No. 2, Rev. 0; Sheet No. 3, Rev. 2; and Sheet Nos. 4 and 5, Rev. 0.

(b) Contents

- (1) Type and form of material

Iridium 192 sources which meet the requirements of special form radioactive material.

- (2) Maximum quantity of material per package

1,000 curies with no more than 240 curies in a single source.

Page 2 - Certificate No. 9165 - Revision No. 0 - Docket No. 71-9165

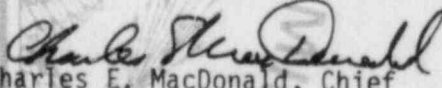
6. The cover bolts shall be provided with tamperproof seal in accordance with 10 CFR §71.43(b).
7. The two (2), 1/4-inch diameter vent holes in the side of the packaging shall be provided with tight fitting rubber or plastic plugs to preclude the entry of rain water into the packaging.
8. The name plate shall be fabricated of material capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: December 31, 1988.

REFERENCES

Technical Operations, Inc. application dated May 21, 1982.

Supplements dated: May 12 and November 10, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: DEC 30 1983

**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
9166	1	USA/9166/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Technical Operations, Inc. Northwest Industrial Park Burlington, MA 01803	Technical Operations, Inc. application dated July 15, 1982, as supplemented.

c. DOCKET NUMBER 71-9166

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.: 864
- (2) Description

The Model No. 864 shipping container is designed for use as a source changer, storage container, and Type B shipping container for radiographic sources in special form. The Model No. 864 source changer is 6.0 inches in diameter and 9.56 inches high. The package incorporates two handles which protrude from the side of the package (8.31 inches at its widest point). Three radioactive source assemblies are housed in brass source tubes. The source tubes are surrounded by uranium metal shielding (43 lbs). The uranium shield assembly is encased in a carbon steel housing with void space filled with a castable rigid polyurethane foam. A deck plate above the shield contains three source latching assemblies and a shipping cover protecting the latching assemblies during shipment. The gross weight of the container is 67 pounds.

Page 2 - Certificate No. 9166 - Revision No. 1 - Docket No. 71-9166

(3) Drawings

The packaging is constructed in accordance with Technical Operations, Inc. Drawing Nos. 86490, Sheets 1 through 6, Rev. 1; and 86491, Sheet 1, Rev. 1.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

360 curies

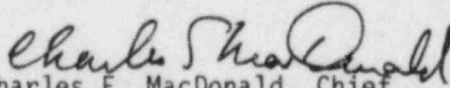
6. The source attached to the source assembly must be secured in the shielded position of the packaging by the source latching assembly with the latch bars in the engaged position. The safety pins shall be operational and the shipping cover shall be in place and secured.
7. The two (2), 1/4-inch diameter vent holes in the sides of the package shall be covered with tape or rubber (plastic) plugs to preclude the entry of rain water into the packaging.
8. Name plates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: January 31, 1988.

REFERENCES

Technical Operations, Inc. application dated July 15, 1982.

Supplement dated: December 28, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: _____

SEP 06 1983

U.S. NUCLEAR REGULATORY COMMISSION

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9167	b. REVISION NUMBER 1	c. PACKAGE IDENTIFICATION NUMBER USA/9167/B(U)	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address) Amersham Corporation 2636 South Clearbrook Drive Arlington Heights, IL 60005	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION Amersham Corporation application dated August 25, 1982, as supplemented 71-9167
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c. DOCKET NUMBER

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 Nos.: 3206B, 3227B, and 3218

(2) Description

The KEG containers are designed for use as Type B shipping containers for neutron sources in special form. The containers are constructed of stainless steel and the dimensions are 16.8 inches in diameter by 20.4 inches high. The containers are filled with water extended polyester (WEP) which provides radiation and thermal protection to the contents. The Model No. 3206B and 3227B containers each have one receptacle for the source (2-inch diameter and 3-inch diameter receptacles, respectively). The Model No. 3218 container has two (2) receptacles for the sources (2-inch diameter and 1.3-inch diameter receptacles). The smaller receptacle will be used only for a reference or calibration source. A stainless steel encased WEP plug will be inserted into the receptacle and held in place by a knurled stainless steel screw cap. A stainless steel latch bar is locked in place over the screw cap with a key operated padlock. The gross weight of each container is 165 pounds.

5. (a) (3) Drawings

The packagings are constructed in accordance with Amersham Corporation Drawing Nos.:

<u>Model No. 3206B</u>	<u>Model No. 3227B</u>	<u>Model No. 3218</u>
0A22413, Rev. D	0A22527, Rev. D	0A22440, Rev. D
1A22299, Rev. G	1A22299, Rev. G	1A22299, Rev. G
3A22297, Rev. C	3A22297, Rev. C	2A22441, Rev. A
3A22420, Rev. B	3A22416, Rev. A	2A22442, Rev. A
2A22442, Rev. A	2A22528, Rev. A	3A22302, Rev. C
2A22385, Rev. B	2A22417, Rev. A	3A22439, Rev. A
2A22419, Rev. C		3A22443, Rev. A
		3A22444, Rev. A
		3A22321, Rev. C

and the "NOTES ON DRAWINGS" given on pp 1-34 and 1-35 of the application (01/17/83).

(b) Contents

(1) Type and form of material

Am-241/Be neutron sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

25 curies

6. Venting of the source receptacle(s) in event of decomposition of the WEP shielding plug due to the accident conditions of transport, shall be provided for by drilling a 1/4-inch hole in the top surface of the screw cap(s). The hole shall be filled with plastic, rubber, or low temperature melt alloy to preclude entry of rain water during normal conditions of transport.
7. Name plates on the container must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: March 31, 1988.

Page 3 - Certificate No. 9167 - Revision No. 1 - Docket No. 71-9167

REFERENCES

Amersham Corporation application dated August 25, 1982.

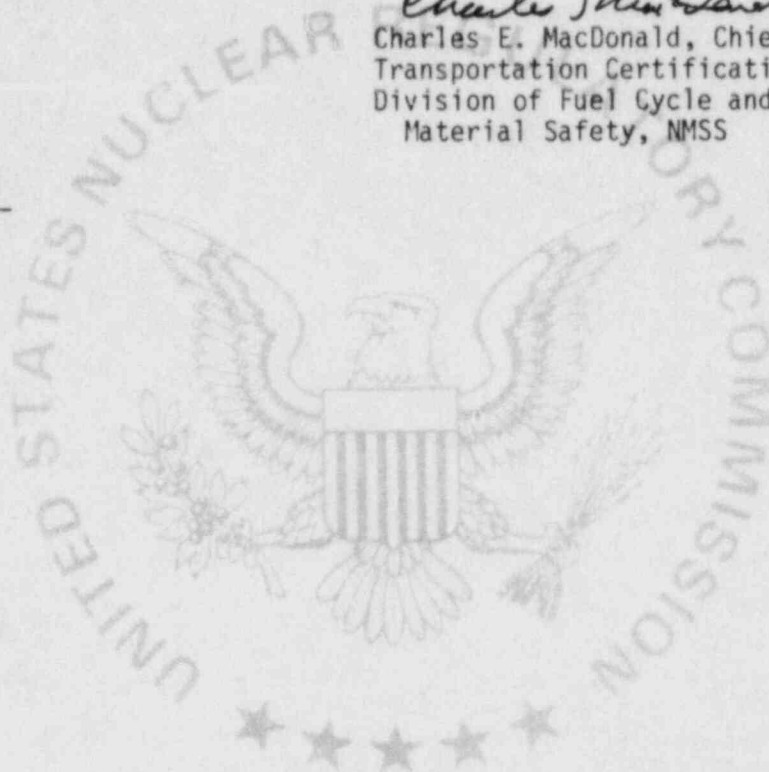
Supplement dated: January 17, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
9174	0	USA/9174/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Atomic Energy of Canada Limited
P.O. Box 6300
Ottawa, Canada K2A 3W3

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Atomic Energy of Canada Limited application
dated February 24, 1983, as supplemented.

c. DOCKET NUMBER

71-9174

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.: F-147

(2) Description

Overpack and F-147 Transfer Case (Cask). The cask is 24-1/4 inches in diameter by 28-11/32 inches in length including two end lids. The cask has truncated conical ends making the cask almost spherical in shape. It is a steel weldment filled with lead for shielding purposes. The cask contains two tube-like drawers which may contain source drawers, or a source drawer and a dummy drawer which provides shielding during transport. Each lid is gasketed and held in place by eight, 5/8-inch socket head bolts. The overpack (including skid) is constructed of a laminated layer of thermal insulating material and wood all contained within a steel frame. The wood is covered with steel sheet (20-gauge). The overpack is fastened to the skid with 20, 1/2-inch cap screws and nuts. The overall dimensions of the overpack and skid is 34-3/8 inches by 39-3/4 inches by 45-1/2 inches high. The cask and overpack are each provided with four lifting eyelets.

The gross weight of the cask, overpack, and skid is 4,260 pounds.

(3) Drawing:

The packaging is constructed in accordance with Atomic Energy of Canada Limited Drawing Nos. TC-3-18, Revision A and D93-V-50, Revision A.

Certificate of Compliance No. 9174 - Revision No. 0 - Docket No. 71-9174

5. (b) Contents

(1) Type and form of material

Cobalt 60 or cesium 137 are sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

15,000 curies of Co-60 or 8,000 curies of Cs-137.

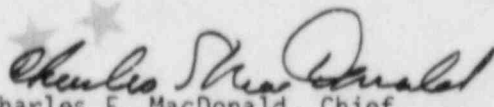
6. Name plates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.
7. The four overpack lifting eyelets shall be covered during transport to preclude their use as lifting or tie-down devices. The outside of the overpack shall be equipped with a feature to show it has not been opened by unauthorized persons.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: October 31, 1988.

REFERENCES

Atomic Energy of Canada Limited application dated February 24, 1983.

Supplements dated: August 3 and October 21, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 28 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9176	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9176/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Nuclear Packaging, Inc. 1010 South 336th Street Federal Way, WA 98003	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: NUPAC application dated October 29, 1982, as supplemented.
c. DOCKET NUMBER 71-9176	

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 Nos.: NUPAC 14/210L and NUPAC 14/210H

(2) Description

Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 77.25-inch ID by 80.25-inch IH cavity. The walls of the casks contain a lead thickness ranging from 1.25 to 1.88 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates with thickness of 2.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch ratchet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12 gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The casks gross weights range from 51,600 to 58,400 pounds.

Model Number	OD, inches	Lead Tk, inches	Top Tk, inches	Bottom Tk, inches	Gross Wt, pounds
NUPAC 14/210L	82.25	1.25	4.0	4.0	51,600
NUPAC 14/210H	83.5	1.88	4.0	4.0	58,400

(3) Drawing

The packages are fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-204D, Sheets 1 and 2, Revision No. D.

(b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 9 watts for the Model Nos. NUPAC 14/210L and NUPAC 14/210H casks.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:
- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
 - (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 20,000 pounds.
8. Except for close fitting contents, shoring shall be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.
9. The lid and shield plug lifting lugs shall not be used for lifting the cask, and shall be covered in transit.
10. The cask shall be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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11. In addition to the requirements of Subpart G of 10 CFR Part 71:
- (i) Prior to each shipment, the packaging Neoprene lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain and vent lines shall be sealed with appropriate sealant applied to the pipe plug threads.
 - (ii) Each cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask shall be leak tested at least every twelve (12) months in accordance with Appendix 8.4 of the application.
12. The cask body and each cask lid shall be marked in accordance with 10 CFR §71.85(c).
13. The packages authorized by this certificate shall be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
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: March 31, 1988.

REFERENCES

Nuclear Packaging, Inc. application dated October 29, 1982*.

Supplements dated: February 18 and March 24, 1983*.

* See Docket No. 71-9159.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard
for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9177	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9177/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

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. PREPARED BY (Name and Address): Nuclear Packaging, Inc. 1010 South 336th Street Federal Way, WA 98003	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: NUPAC application dated October 29, 1982, as supplemented.
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c. DOCKET NUMBER **71-9177**

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.: NUPAC 10/140
- (2) Description
- Steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder with a 66.0-inch ID by 73.0-inch IH cavity. The walls of the cask contain a lead thickness of 2.75 inches encased in 0.50-inch thick inner steel shell and 1.13-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch ratchet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The cask may be provided with an optional 12 gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The cask is provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The cask has a gross weight of 56,500 pounds.
- (b) Drawing
- The package is fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-204D, Sheets 1 and 2, Revision No. D.

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(b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 24 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 15,000 pounds.

8. Except for close fitting contents, shoring shall be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

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9. The lid and shield plug lifting lugs shall not be used for lifting the cask, and shall be covered in transit.
10. The cask shall be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.
11. In addition to the requirements of Subpart G of 10 CFR Part 71:
 - (i) Prior to each shipment, the packaging Neoprene lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain and vent lines shall be sealed with appropriate sealant applied to the pipe plug threads.
 - (ii) The cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask shall be leak tested at least every twelve (12) months in accordance with Appendix 8.4 of the application.
12. The cask body and each cask lid shall be marked in accordance with 10 CFR §71.85(c).
13. The package authorized by this certificate shall be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
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: March 31, 1988.

REFERENCES

Nuclear Packaging, Inc. application dated October 29, 1982*.

Supplements dated: February 18 and March 24, 1983*.

* See Docket File No. 71-9159

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard
 for Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: Jul 12 1984

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1 a. CERTIFICATE NUMBER 9178	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9178/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

NUPAC application dated October 29, 1982,
as supplemented.

c. DOCKET NUMBER 71-9178

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.: NUPAC 7/100

(2) Description

Steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder with a 75.5-inch ID by 40.75-inch IH cavity. The walls of the cask contain a lead thickness of 3.00 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.5 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch ratchet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The cask may be provided with an optional 12 gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The cask is provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The cask has a gross weight of 48,900 pounds.

(b) Drawing

The package is fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-204D, Sheets 1 and 2, Revision No. D.

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5. (b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 17 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 13,000 pounds.

8. Except for close fitting contents, shoring shall be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and shield plug lifting lugs shall not be used for lifting the cask, and shall be covered in transit.

10. The cask shall be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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11. In addition to the requirements of Subpart G of 10 CFR Part 71:
- (i) Prior to each shipment, the packaging Neoprene lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain and vent lines shall be sealed with appropriate sealant applied to the pipe plug threads.
 - (ii) The cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask shall be leak tested at least every twelve (12) months in accordance with Appendix 8.4 of the application.
12. The cask body and each cask lid shall be marked in accordance with 10 CFR §71.85(c).
13. The package authorized by this certificate shall be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
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: March 31, 1988.

REFERENCES

Nuclear Packaging, Inc. application dated October 29, 1982*.

Supplements dated: February 18 and March 24, 1983*.

* See Docket File No. 71-9159

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegarde

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUL 12 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9179	b. REVISION NUMBER 2	c. PACKAGE IDENTIFICATION NUMBER USA/9179/A	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
 - 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. PREPARED BY (Name and Address): Nuclear Packaging, Inc. 1010 South 336th Street Federal Way, WA 98003	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: NUPAC application dated October 29, 1982, as supplemented.
c. DOCKET NUMBER 71-9179	

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 Nos.: NUPAC 6/100L and NUPAC 6/100H
 - (2) Description
Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 61.0-inch ID by 62.0-inch IH cavity. The walls of the casks contain a lead thickness ranging from 2.43 to 3.56 inches encased in 0.50-inch thick inner steel shell and 1.13-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch ratchet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12 gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The casks gross weights range from 42,900 to 53,900 pounds.

Model Number	OD, inches	Lead Tk, inches	Top Tk, inches	Bottom Tk, inches	Gross Wt, pounds
NUPAC 6/100L	69.11	2.43	4.5	4.5	42,900
NUPAC 6/100H	71.37	3.56	6.0	6.0	53,900

- (3) Drawing
The packages are fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-204D, Sheets 1 and 2, Revision No. D.

Page 2 - Certificate No. 9179 - Revision No. 2 - Docket No. 71-9179

(b) Contents

(1) Type and form of material

- (i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or
- (ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 9 watts for the Model No. NUPAC 6/100L cask and 61 watts for the Model No. NUPAC 6/100H cask.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

- (i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F); or
- (ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

- (b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

- 7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 12,000 pounds.
- 8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.
- 9. The lid and shield plug lifting lugs must not be used for lifting the cask, and shall be covered in transit.

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10. The cask shall be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.
11. In addition to the requirements of Subpart G of 10 CFR Part 71:
 - (i) Prior to each shipment, the packaging Neoprene lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain and vent lines shall be sealed with appropriate sealant applied to the pipe plug threads.
 - (ii) Each cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask shall be leak tested at least every twelve (12) months in accordance with Appendix 8.4 of the application.
12. The cask body and each cask lid shall be marked in accordance with 10 CFR §71.85(c).
13. The package authorized by this certificate shall be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.
14. The packages authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
15. Expiration date: March 31, 1988.

REFERENCES

Nuclear Packaging, Inc. application dated October 29, 1982*.

Supplements dated: February 18 and March 24, 1983*.

* See Docket File No. 71-9159

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

RH Odegaard

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: 12 1984

**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
9180	1	USA/9180/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
Automation Industries, Inc.
P.O. Box 245
Phoenixville, PA 19460

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Automation Industries, Inc. application
dated January 27, 1983, as supplemented.

c. DOCKET NUMBER: 71-9180

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.: 500SU-0P
- (2) Description

Radiographic device within protective overpack. The overpack consists of an outer container which is a 15-1/8" diameter by 13-3/4" high, 18 gauge drum and cover (Ms-27683-30). Closure is provided by a 12 gauge locking ring and lugs which is secured with a 3/8"-16UNC-3-1/4" bolt and nut. The void space between the drum and radiographic device is filled with a tight fitting two piece molded hair pack. The packaging (drum) is provided with four (4), 1/4" vent holes. Maximum gross weight of the package is 80 pounds.

(3) Drawing

The package is constructed in accordance with Automation Industries, Inc. Drawing No. D-500SU-0P, Revision No. -.

Page 2 - Certificate No. 9180 - Revision No. 1 - Docket No. 71-9180

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

300 curies

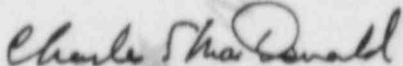
6. The contents must be secured within a Model No. 500-SU radiographic source changer (NRC Certificate of Compliance No. 9006, Docket No. 71-9006).
7. Prior to each shipment, each vent hole shall be covered with a weatherproof patch such as duct tape or other similar waterproof material.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: June 30, 1988.

REFERENCES

Automation Industries, Inc. application dated January 27, 1983.

Supplements dated: March 2 and April 21, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983

**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
9181	0	USA/9181/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc. application dated
dated March 31, 1983, as supplemented.

c. DOCKET NUMBER 71-9181

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 Nos.: PAS-2 and PAS-2A

(2) Description

The packaging consists of an outer overpack, inner overpack, optional secondary containment vessel (Model No. PAS-2A), sample shield, and a sample vial. The outer foam filled overpack is constructed identical to the Model No. N-55 overpack (Docket No. 9070), 32" OD x 48" high. The inner overpack consists of a Department of Transportation Specification 17H steel drum lined with rigid polyurethane foam cut to fit the outside dimensions of the secondary containment vessel. The optional secondary containment vessel is fabricated from carbon or stainless steel (17.7" OD x 24 3/4" high) and is provided with a Viton O-ring and eight, 5/16" cap screws. The secondary containment vessel is equipped with a test port. The sample shield consists of a lead filled steel weldment (16.5" OD x 22.75" high) provided with four shielded wall penetrations and a shielded lid (all gasketed with Viton O-rings). The 3-3/4" ID x 8-1/4" high sample shield cavity contains a valved sample vial surrounded by absorbent vermiculite and lead shot. The vial may contain about 50 milliliters of liquid (reactor coolant water sample). The gross weight of the package is approximately 2,400 pounds.

(3) Drawings

The packages are constructed in accordance with Nuclear Packaging, Inc. Drawing Nos.: X-20-220D, Sheets 1 through 4, Rev. C and X-60-200D, Rev. C.

Page 2 - Certificate No. 9181 - Revision No. 0 - Docket No. 71-9181

5. (b) Contents

(1) Type and form of material

Radioactive material in the form of liquid coolant sample obtained from a reactor coolant system.

(2) Maximum quantity of material per package

50 milliliters with a thermal heat load not to exceed 3.0 watts.

6. In addition to the requirements of Subpart G of 10 CFR Part 71, each package prior to first use must meet the acceptance tests and criteria specified in Section 8.1, must be maintained in accordance with Section 8.2, and prepared for shipment in accordance with Section 7.0 of the application. The sample vial must be annually leak tested to the requirements of LT-12 (Appendix 8.3.2).
7. The statement of acceptance in NUPAC's test, Assembly Helium Sniffer Test for the NUPAC PAS-2 Packaging (5.1, LT-16, Rev. 2, March 9, 1984) must be replaced by the following acceptance criteria: For each assembly to have an acceptably low leakage rate, the detection equipment must be capable of detecting a leak of 10^{-4} scc/sec or smaller. Any detected leakage rate greater than the acceptance criteria prior to first use is not acceptable.
8. Prior to first use of each package, the leak tests specified as Notes 8 and 14 on Drawing No. X-20-2200, Rev. C must be performed, as required.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: March 31, 1989.

REFERENCES

Nuclear Packaging, Inc. application dated March 31, 1983.

Supplements dated: September 9, 1983; and February 17 and March 9, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R H Odegarben

for Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: MAR 29 1984

**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
9182	0	USA/9182/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- b. This certificate does not relieve the consignee from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including that of 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. PREPARED BY (Name and Address):

U.S. Department of Agriculture
Radiological Safety Staff
Beltsville, MD 20705

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc. application dated
May 16, 1983, as supplemented.

c. DOCKET NUMBER

71-9182

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.: Husman Irradiator
- (2) Description

The package is a cylindrical, steel-encased, lead filled weldment 36.4" OD by 39.6" high. The package is provided with two foam impact limiters. The dimensions of the package with the attached impact limiters is 53.5" OD by 56.0" high. The impact limiters are held in place by three (3) turnbuckles. The irradiator consists of a rotating annular rotor between an integral central core and the outer annular shell. Three equally spaced specimen chambers in the rotor are used to transport pupae containers to the irradiation position. The entire cask assembly is welded closed to preclude removal of the sealed sources. The package weight is 17,000 pounds.

- (3) Drawings

The packaging is constructed in accordance with Nuclear Packaging, Inc. Drawing No. SK-209, Sheets 1 and 2, Revision B.

(b) Contents

- (1) Type and form of material

Cesium 137 sources meeting requirements for special form radioactive material.

- (2) Maximum quantity of material per package

50,000 ci.

Page 2 - Certificate No. 9182 - Revision No. 0 - Docket No. 71-9182

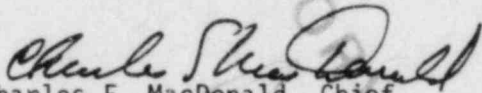
- 6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 7. Expiration date: October 31, 1988.

REFERENCES

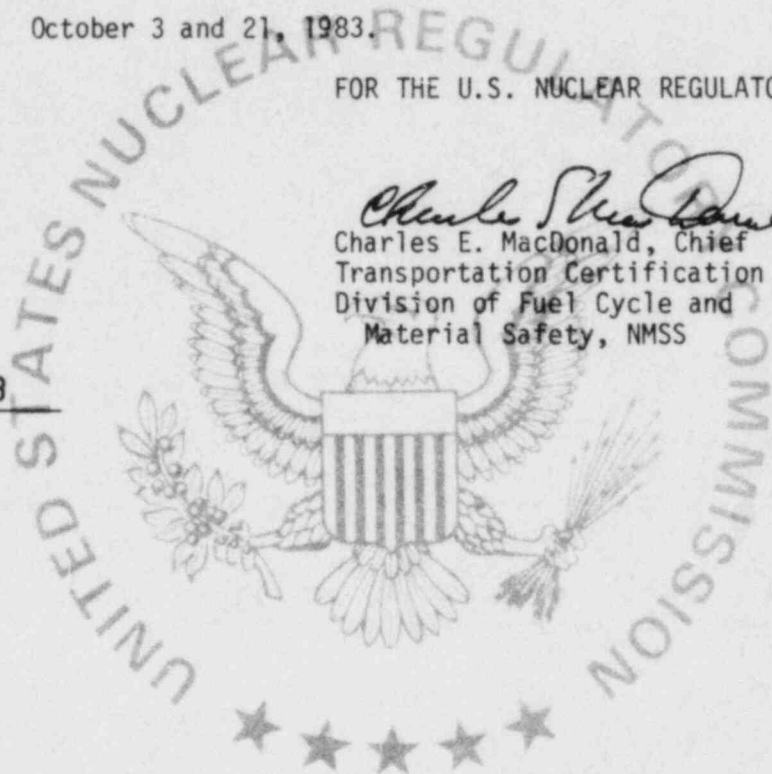
Nuclear Packaging, Inc. application dated May 16, 1983.

Supplements dated: October 3 and 21, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 26 1983



**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
9183	2	USA/9183/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation
5720 Peachtree Parkway
Norcross, GA 30092

Nuclear Assurance Corporation application dated
June 30, 1984, as supplemented.

c. DOCKET NUMBER

71-9183

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-1

(2) Description

A steel and lead shielded shipping cask. The cask is a right circular cylinder with upper and lower steel encased balsa impact limiters. The overall dimensions are 214 inches in length and 50 inches in diameter. The gross weight of the cask is approximately 49,000 pounds. The inner cavity is 178 inches long and 13.5 inches in diameter. The thickness of the inner shell is 5/16 inch and 1-1/4 inches for the outer shell. The two stainless steel shells are welded to a 2-inch thick stainless steel shield disc at the bottom. The annulus between the inner and outer shells is filled with lead (max. lead thickness 6-5/8 inches, minimum 5 inches).

The lid is stainless steel frustum of cone 7.5 inches thick. The lid is secured to the cavity flange by six, ASTM-A320, Grade L43, 1-1/4 inch diameter bolts. The seal is provided by two polytetrafluoroethylene O-rings. Four trunnions, two located on either side of the upper or lower impact limiter, are provided. Other cask features include two drain valves located in the bottom shield disc, vent valve, head closure gasket leak check valve, and rupture disc - pressure relief valve system located in the cavity flange. For transport the cask may be enclosed in an expanded metal cage.

(3) Drawings

The Model No. NAC-1 shipping cask is constructed in accordance with Nuclear Fuel Services, Inc., Drawing No. E 10080, Sheets 1 through 4, Rev. 20.

Page 2 - Certificate No. 9183 - Revision No. 2 - Docket No. 71-9183

5. (b) Contents

(1) Type and form of material

- (i) Clad, irradiated metallic natural uranium fuel rods.
- (ii) Solid nonfissile irradiated hardware.

(2) Maximum quantity of material per package

The cavity content must not exceed a thermal decay heat load of 625 watts and a weight of 3,700 lbs including weight of component spacers (or fuel basket) used in the cask cavity to limit movement of contents during shipment. Fuel rods are additionally limited as follows:

- (i) 21 intact rods or 10 encapsulated (defective) rods
- (ii) 1,600 MWD/MTU average burn-up
- (iii) cooled for at least 730 days after irradiation

(c) Fissile Class

I

- 6. The cask cavity must be dry (no free water) when delivered to a carrier for transport.
- 7. As needed, appropriate component spacers (fuel basket and axial spacers for shipment of fuel rods) must be used in the cask cavity to limit movement of contents during accident conditions of transport.
- 8. The neutron shield tanks must be drained and maintained in a dry condition in accordance with Section 7 of the application, as supplemented.
- 9. In lieu of the requirements of 10 CFR §71.87(e), the licensee must perform periodic maintenance and testing of O-rings, drain and vent ball valves, relief valves, and rupture discs of the cask as indicated in the table given below. During inactive periods, the maintenance and testing frequency may be disregarded provided that the package is brought into full compliance prior to the next use of the package.

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<u>Cask Component</u>	<u>Period</u>	<u>Test/Action</u>
Ball Valve	Each shipment	Hydro test to 30 psig*
Ball Valve	Annually	Replace seats and seals
O-rings	Each shipment	Test to 30 psig*
O-rings	Annually	Test to 100 psig*
Inner Containment Vessel	Annually	Test to 100 psig*
Cavity Relief Valve	Annually	Test at set point
Cavity Rupture Disc	Annually	Replace
Neutron Shield Tank Rupture Disc	Annually	Replace
Impact Limiters	Annually	Test to 5 psig*

*There must be no visual (pressure gauge) indications of pressure drop for the component under test during a 10-minute test period. Otherwise, corrective action must be taken and the test repeated until such time as the component meets the specified test. (Test to pressures equal to or greater than those indicated.)

10. Fabrication of additional packagings is not authorized.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
12. Expiration date: September 30, 1989.

REFERENCES

Nuclear Assurance Corporation application dated June 30, 1984.

Supplement dated: September 10, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: OCT 01 1984

**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
9184	0	USA/9184/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Nuclear Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc. application dated
October 6, 1983, as supplemented.

c. DOCKET NUMBER

71-9184

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.: PAS-1
- (2) Description

The packaging consists of a primary containment vessel (20.5" OD x 23.4" OH) enclosed inside a secondary containment vessel and radiation shield (32.5" OD x 39.0" OH). The 15 milliliter water sample is contained within a undefined sample cask. Additionally, four iodine collection cartridges and four offgas vials are maintained inside the foam shoring above the sample cask. Loose vermiculite surrounds the perimeter of the sample cask to absorb the water sample should leakage occur. Completely surrounding the secondary containment vessel and radiation shield is a foam filled steel encased overpack (48.0" OD x 66.0" OH) which provides impact and thermal protection.

The primary containment vessel which is constructed of 304 stainless steel varying in thickness from 3/4" to 1.25" is provided with double Viton O-ring seals and a sealed test port between the seals for leak testing. The assembly is secured with eight, 3/8"-16 UNC x 8" long screws.

The secondary containment vessel and radiation shield provides 0.75" thick steel and 5.1" thick lead shielding in the radial direction, 2.0" thick steel and 5.1" thick lead shielding on the bottom, and 3.5" thick steel and 4.8" thick lead shielding on the top. The lid is secured with eight, 1.0"-8 UNC x 3.0" long bolts. The lid is sealed with two Viton O-rings with a sealed test port between the seals for leak testing.

The overpack provides about 7.25" thick foam on the sides and about 13" on the top and bottom. The two halves of the overpack are held together by eight, 3/4"-10 UNC x 1.5" long bolts. A Neoprene gasket prevents rain water from entering the overpack.

The weight of the package, including a maximum sample cask weight of 1,375 pounds, is about 12,800 pounds.

Page 2 - Certificate No. 9184 - Revision No. 0 - Docket No. 71-9184

(3) Drawings

The package is constructed in accordance with Nuclear Packaging, Inc. Drawing No. X-20-218D, Sheets 1 and 2, Rev. B.

(b) Contents

(1) Type and form of material

- (i) Radioactive material in the form of liquid coolant sample obtained from a reactor coolant system and up to four iodine collection cartridges and four offgas vials.
- (ii) Greater than Type A quantities of byproduct material consisting of process solids or resins, either dewatered, solid, or solidified in sealed secondary containers.

(2) Maximum quantity of material per package

15 milliliters of liquid; and 43 Ci of mixed fission products.

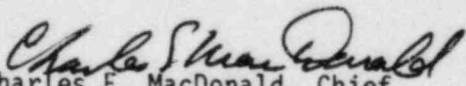
- 6. In addition to the requirements of Subpart G of 10 CFR Part 71, each package prior to first use must meet the acceptance tests and criteria specified in Section 8.1, must be maintained in accordance with Section 8.2, and prepared for shipment in accordance with Section 7.0 of the application.
- 7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
- 8. Expiration date: April 30, 1989.

REFERENCES

Nuclear Packaging, Inc. application dated October 6, 1983.

Supplements dated: February 17 and April 10, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 20 1984

**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
9185	0	USA/9185/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
 - b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Industrial Nuclear Company
1124 Chess Drive
Foster City, CA 94404

Industrial Nuclear Company application dated
October 13, 1983.

c. DOCKET NUMBER 71-9185

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.: OP-100
- (2) Description

Protective overpack for Model No. IR-100 exposure device. The overpack consists of an outer container which is a 10-gallon open head steel drum having a minimum 20-gauge body and cover, welded seams and a 12-gauge clamp-ring type head closure. The 45 pound exposure device is centered by plywood supports within the drum. The gross weight of the exposure device and overpack is 70 pounds.

(3) Drawings

The overpack is constructed in accordance with Industrial Nuclear Company Drawing Nos.: 100-4, Rev. -; and 100-4(A), Rev. -.

Page 2 - Certificate No. 9185 - Revision No. 0 - Docket No. 71-9185

(b) Contents

(1) Type and form of material

Iridium 192 sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies.

6. The sources must be contained within the Model No. IR-100 packaging in accordance with Certificate of Compliance No. 9157.
7. The name plate on the overpack must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility. The two vent holes in the side of the overpack must be covered with tape or rubber (plastic) plugs to prevent entry of rain water.
8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
9. Expiration date: July 31, 1987.

REFERENCES

Industrial Nuclear Company application dated December 23, 1981*.

Supplements dated: May 28, 1982*; and October 13, 1983 (two letters)*.

*See Docket No. 71-9157.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: OCT 27 1983

**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
9186	3	USA/9186/AF	1	4

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
U.S. Department of Energy Division of Naval Reactors Washington, DC 20585	Safety Analysis for Shipping S8G Power Units in the S-6213 Container, Rev. 7, dated June 16, 1975, as supplemented.
	c. DOCKET NUMBER 71-9186

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.: S-6213 Power Unit Shipping Container
- (2) Description

A power unit shipping container (PUSC) for shipment of a power unit complete with control rods and control rod drive mechanisms installed.

The PUSC consists of a carbon steel cylindrical shell approximately 9-1/4 feet in outside diameter by 39-1/2 feet long, including hemispherical steel end impact limiters, with 10-3/4-foot outside diameter central flanges joining the barrel and cover halves. A power unit is supported in the PUSC by a centrally located thick circular steel plate (PU head) which is clamped between the central mating flanges of the PUSC fastened by 94, 2-inch diameter high strength studs. The upper and lower extremities of the power unit cantilever into the barrel and cover halves without additional support except for the longest control rod drive mechanisms (Power Unit B only).

The PUSC is shipped in the horizontal position on a support frame which is secured to a specially built flatbed rail car. The PUSC, including frame and contents, weighs approximately 490,000 pounds.

Page 2 - Certificate No. 9186 - Revision No. 3 - Docket No. 71-9186

5. (a) Cont'd

(3) Drawings

The Model No. S-6213 PUSC is constructed in accordance with the Drawing Nos. specified in the attachment to this certificate.

(b) Contents

(1) Type and form of material

Unirradiated Naval Reactors Type A or B power unit as described in Chapter 5 of the application and containing uranium enriched in the U-235 isotope.

(2) Maximum quantity of material per package

One Type A or Type B power unit.

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

6. All control rods shall be restrained in the power unit fuel cells by the control rod holddown latches.
7. In addition to the requirements of Subpart G of 10 CFR Part 71, a determination shall be made, for each shipment, of the "g" forces that the package or packaging has been subjected to during transport.
- (a) A nondestructive examination of the entire length of both inner and outer surfaces of the four tie-down support bracket-to-container wall butt welds shall be conducted:
- (1) if the packaging (with or without contents) has been subjected to "g" forces in excess of 2 g's in any direction through the center of gravity of the package since the last inspection, and
 - (2) following the fourth shipment,* and
 - (3) after every second shipment* following the fourth shipment.

*This requirement shall not be construed to require an inspection if the previous shipment had been inspected in accordance with (7(a)(1)) above.

Page 3 - Certificate No. 9186 - Revision No. 3 - Docket No. 71-9186

7. Cont'd

- (b) The nondestructive examination in accordance with a written procedure may be by either:
- (1) The liquid penetrant method in accordance with:
 - (i) Article 6, Section V, ASME Code, or
 - (ii) MIL-STD-271E, "Nondestructive Testing Requirements for Metals," Section 5, October 31, 1973, or
 - (iii) NAVSHIPS 250-1500-1, "Welding Standard," Section 12.5.
 - (2) or the magnetic particle method in accordance with:
 - (i) Article 7, Section V, ASME Code (Yoke Technique; Dry Particle Method; direct or rectified current), or
 - (ii) MIL-STD-271E, Section 4; specifically 4.3.1 (General) and 5.6.1 (coatings), 4.3.3 (Dry Powder), 4.3.3.3.6 (Continuous), and 4.3.3.3 (Procedure) as excepted by using direct or rectified current, 4.3.3.3.3 (Yoke Technique), 4.3.2.5 (sensitivity and cleaning), and 4.3.1.3 (smoothness), or
 - (iii) NAVSHIPS 250-1500-1, Sections 12.4, 12.4.1 (General), 12.4.3 (Dry powder), 12.4.3.3.2.1 (Yoke Technique) using direct or rectified current.
- (c) If any indications, as defined in accordance with either:
- (i) Paragraph UA-93(a), Appendix VIII, Division 1, Section VIII, ASME Code (with 7(b)(1)(i), above), or
 - (ii) Paragraphs UA-72 and UA-73, Appendix VI, Division 1, Section VIII, ASME Code (with 7(b)(2)(i), above), or
 - (iii) Class 1 acceptance criteria of NAVSEA 0900-LP-003-8000, "Surface Inspection Acceptance Standards for Metals," with Change 2, July 1, 1974 (with 7(b)(1)(ii) or 7(b)(2)(ii), above), or
 - (iv) NAVSHIPS 250-1500-1, Section 10.3.2 (with 7(b)(1)(iii) or 7(b)(2)(iii), above), as noted,

are detected, the packaging shall be repaired and reinspected prior to use and shall be inspected prior to each shipment thereafter. Any defects shall be reported in accordance with 10 CFR Part 71.95.

8. Expiration date: August 31, 1987.

Page 4 - Certificate No. 9186 - Revision No. 3 - Docket No. 71-9186

REFERENCES

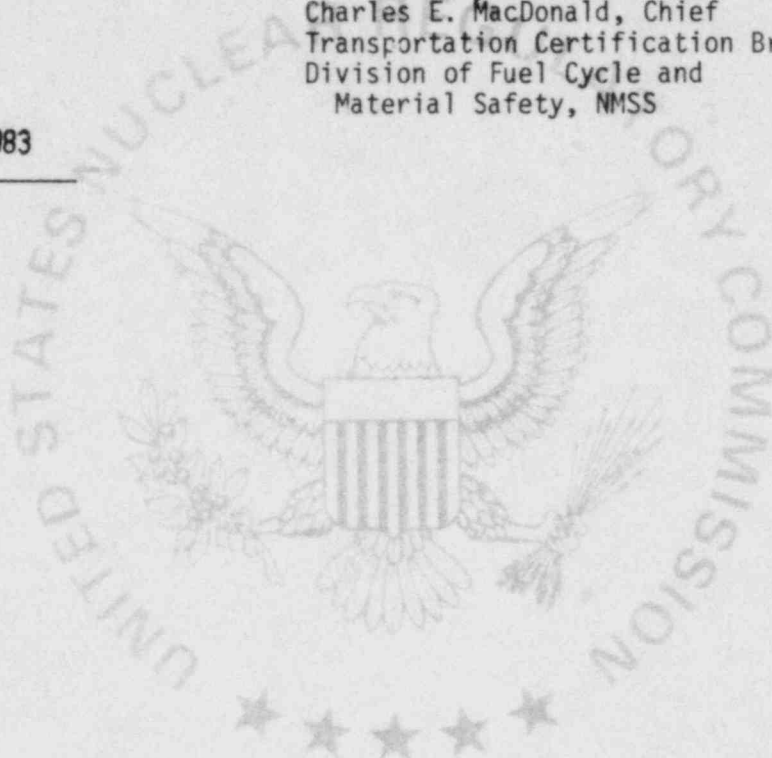
U.S. Naval Reactors application dated July 24, 1975.

Supplements dated: June 3, 1977; and July 24, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



Page 1 of 2 - Certificate No. 9186 - Revision No. 3 - Docket No. 71-9186

ATTACHMENT

The packaging is constructed in accordance with Bingham-Willamette Co. Drawing Nos.:

F-358, Sh. 1 of 1, Rev. A
F-372, Sh. 1 of 1, Rev. A
F-373, Sh. 1 and 2 of 2, Rev. A
F-374, Sh. 1 of 1, Rev. A
F-376, Sh. 1 of 1, Rev. A
F-377, Sh. 1 of 1, Rev. A
F-404, Sh. 1 of 1, Rev. J
F-405, Sh. 1 of 1, Rev. G
F-406, Sh. 1 of 1, Rev. J
F-408, Sh. 1 of 1, Rev. K
F-409, Sh. 1 of 1, Rev. J
F-424, Sh. 1 of 1, Rev. J
F-425, Sh. 1 of 2, Rev. L
F-425, Sh. 2 of 2, Rev. H
F-494, Sh. 1 of 2, Rev. J
F-494, Sh. 2 of 2, Rev. P
F-495, Sh. 1 of 2, Rev. M
F-495, Sh. 2 of 2, Rev. M
F-496, Sh. 1 of 1, Rev. N

The contents are as shown in Royal Industries, Inc., Drawing No. 130J039, Sh. 1 of 2, Rev. M and General Electric Drawing Nos.:

127D9647, Sh. 1 and 2 of 4, Rev. C
284E809, Rev. 0
291E201, Sh. 1 through 3 of 3, Rev. F
291E234, Rev. C
291E246, Sh. 1 and 2 of 2, Rev. C
291E258, Rev. C
291E284, Rev. C
294E810, Sh. 1 of 2, Rev. C
294E811, Sh. 1 of 2, Rev. C
294E812, Rev. C
294E902, Sh. 1 of 4, Rev. N
294E902, Sh. 2 of 4, Rev. M
294E902, Sh. 3 of 4, Rev. K
294E902, Sh. 4 of 4, Rev. N
294E912, Sh. 1 and 2 of 2, Rev. J
294E930, Sh. 2 of 2, Rev. 0

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ATTACHMENT (Cont'd)

294E963, Sh. 1 through 3 of 3, Rev. B
294E966, Sh. 2, 4, 5, and 8 of 8, Rev. B
296E204, Rev. B
296E261, Sh. 2 of 2, Rev. C
299E411, Rev. B
299E412, Rev. D
7543E10, Rev. J
7543E23, Sh. 1 of 2, Rev. D
7548E27, Sh. 1 and 2 of 4, Rev. C
7543E29, Sh. 1 and 2 of 3, Rev. C
7543E30, Rev. A
7543E65, Rev. E
7543E68, Rev. O
7543E83, Rev. O



**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
9187	0	USA/9187/B(U)	1	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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Tech/Ops
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Tech/Ops application dated December 27, 1983,
as supplemented.

c. DOCKET NUMBER 71-9187

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.: 865

(2) Description

A steel encased, uranium shielded radiographic exposure device 5"OD x 12.25" long. The device is provided with 0.88" OD x 9.25" long handle and two 1.38" x 5.5" long triangular shaped legs. Primary components consist of an outer steel shell, internal bracing, depleted uranium shield, and a source tube. The contents are securely positioned in the source tube by a source holder assembly and actuator and locking assembly. Tamper-proof seals are provided on the packaging and a 0.12-inch thick steel outer cover is bolted over the source actuator and locking assembly for additional protection during transport. The total weight of the package is approximately 59 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Tech/Ops Drawing Nos.: 86590, Sheets 1 through 5, Rev. 1; 86591, Rev. 1; and 86500-10, Rev. 0.

Page 2 - Certificate No. 9187 - Revision No. 0 - Docket No. 71-9187

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed source must meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 curies.

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

7. Expiration date: March 31, 1989.

REFERENCES

Tech/Ops application dated December 27, 1983.

Supplement dated: March 15, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Original Signed by
CHARLES E. MACDONALD

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: March 23, 1984

**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
189	1	USA/9189/AF	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
UNC Naval Products
67 Sandy Desert Road
Uncasville, CT 06382
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
UNC Naval Products application dated
February 2, 1984, as supplemented.
- c. DOCKET NUMBER: 71-9189

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.: 9189
 - (2) Description
Packaging meeting the requirements of DOT Specification 7A (49 CFR §173.415(a)) and the requirements of 10 CFR §71.43.
 - (b) Contents
 - (1) Type and form of material
Double encapsulated fuel packs specified in Items 5b and 5d in Table 10.0-1, Part I, (p 10.0-7c), as approved on or before May 18, 1983 to SNM License No. 368.
 - (2) Maximum quantity of material per package
Not to exceed a Type A quantity of radioactive material and the stated dry and wet safe quantities (without reference to notes or supplements) in Items 5b and 5d in Table 10.0-1, Part I, (p 10.0-7c), as approved on or before May 18, 1983 to SNM License No. 368.
 - (c) Fissile Class I

Page 2 - Certificate No. 9189 - Revision No. 1 - Docket No. 71-9189

6. The name plate to which the model number is affixed must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintain its legibility.
7. The package authorized by this certificate is hereby approved for use under the general license provision of 10 CFR §71.12.
8. Expiration date: March 31, 1989.

REFERENCES

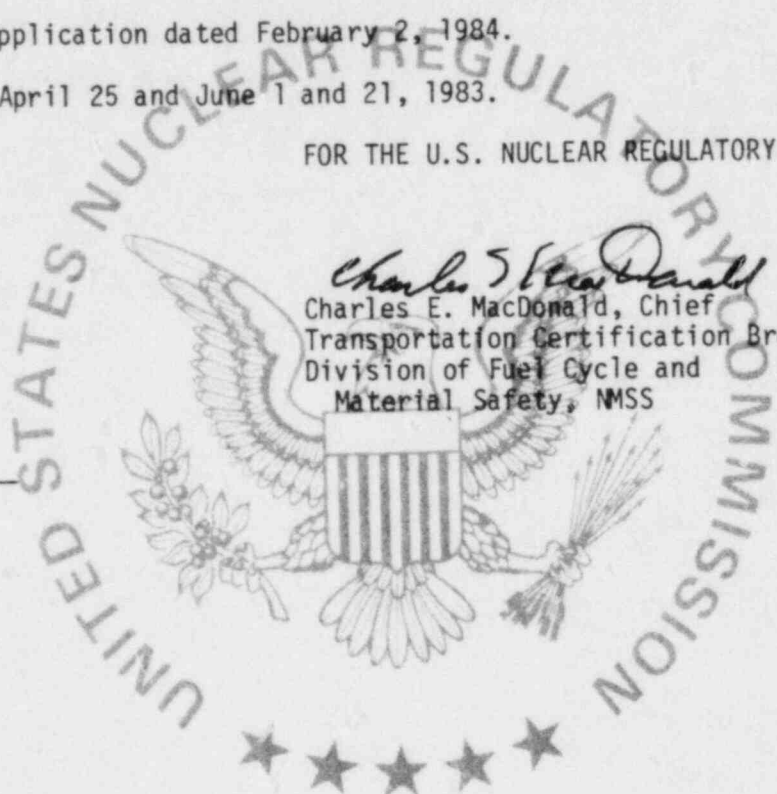
UNC Naval Products application dated February 2, 1984.

Supplements dated: April 25 and June 1 and 21, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: JUN 11 1984



**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

a. CERTIFICATE NUMBER 9191	b. REVISION NUMBER 0	c. PACKAGE IDENTIFICATION NUMBER USA/9191/AF	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Babcock & Wilcox P.O. Box 785 Lynchburg, VA 24505	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Babcock & Wilcox application dated April 5, 1984, as supplemented.
c. DOCKET NUMBER 71-9191	

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 Nos.:

ORNL Unirradiated Fuel Shipping Container, or
BNL Unirradiated Fuel Shipping Container

(2) Description

A right cylindrical stainless steel drum enclosing a fuel basket provided with seven cavities. The outer shell and lid are fabricated from 11 gauge plate and the base is 1/4" thick plate. The outer lid is held in place by six, 5/8" bolts (stainless steel) and nuts (carbon steel). The basket is fabricated from 16 gauge stainless steel and the base is fabricated from 11 gauge stainless steel plate. Eight, 3/8" bolts and nuts retain the basket lid (0.125" thick aluminum) in place.

The basket is supported on 2" by 6" timbers inside the outer shell. The remaining space around the basket is filled with phenolic foam insulation.

<u>Item</u>	<u>ORNL</u>	<u>BNL</u>
Outside dimension, in	24-1/2	24-1/2
Container length, in	56-5/8	75-1/2
Base, in	29 x 29	29 x 29
Inside cavity cross section, in	4 x 4	4 x 4
Inside cavity length, in	39-1/4	58-1/8
Gross weight, lb	580	700

Page 2 - Certificate No. 9191 - Revision No. 0 - Docket No. 71-9191

5. (a) (3) Drawings

The packaging is constructed in accordance with ORNL Drawing Nos.:

ORNL Container - X3E-10191-002, Rev. B,
X3E-10191-003, Rev. B,
DS-XDE-10191-1, Rev. 1; or

BNL Container - X3E-10191-010, Rev. B,
X3E-10191-011, Rev. B;
DS-XDE-10191-2, Rev. 1.

(b) Contents

(1) Type and form of material

Unirradiated uranium R-2 fuel element enriched in the U-235 isotope composed of aluminum plates.

(2) Maximum quantity of material per package

Seven uranium silicide (U_3Si_2)-Al fuel elements containing 500 grams U-235 per fuel element with a U-235 enrichment of 20 w/o.

(c) Fissile Class

I

6. The fire resistant phenolic foam shall be in accordance with AEC Materials and Equipment Specification SP-9 or as modified by ORGDP Reports K/TL-729 and K/P-6567S.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: April 30, 1989.

Page 3 - Certificate No. 9191 - Revision No. 0 - Docket No. 71-9191

REFERENCES

Babcock & Wilcox application dated April 5, 1984.

Safety Analysis Report for Packaging: The Unirradiated Fuel Shipping ORNL/ENG/TM-15, September 1979*.

Nuclear Criticality Safety Assessment of ORR, NBS, HFBR Fuel Element Shipping Package, J. T. Thomas, ORNL/CDS/TM-77*.

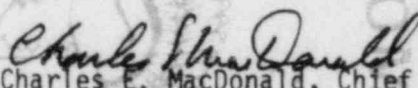
Union Carbide letter dated September 10, 1979*.

ORNL letter dated September 18, 1979*.

Department of Energy letter dated November 1, 1979*.

*See Docket File No. 71-9853.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: APR 23 1984

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1 a. CERTIFICATE NUMBER 9503	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/9503/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address): Monsanto Research Corporation Mound Laboratory Miamisburg, OH 45342	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION: Monsanto Research Corporation Report No. MLM-2074 dated June 28, 1974
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c. DOCKET NUMBER
71-9503

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.: MWH-IHS-SC
- (2) Description

A multi-hundred watt isotope heat source shipping container. Main components consist of a carrier and a finned cask. The carrier body is fabricated of heavy gauge steel screen welded to channel and angle iron frame members. The base plate is a 3/4-inch thick steel plate. The carrier top is fabricated of aluminum screen welded to aluminum frame members to facilitate handling. Approximate dimensions of the carrier are 62 inches in height with a width and length of 49 inches.

The finned cask, positioned within the carrier, is made of stainless steel with aluminum fins to dissipate heat. The cask is about 43 inches in both height and diameter. The maximum gross weight of the packaging and contents is 3,000 pounds.

Page 2 - Certificate No. 9503 - Revision No. 4 - Docket No. 71-9503

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following Monsanto Research Corporation Drawing Nos.:

5-2059, Sheet 1, Rev. A Multi-Hundred Watt Isotope Heat
Sheet 2, Rev. A Source Shipping Container;

5-2060, Sheet 1, Rev. B Carrier Body;
Sheet 2, Rev. A

5-2061, Sheet 1, Rev. B Carrier Cap;
Sheet 2, Rev. A

5-2062, Sheet 1, Rev. B Cask; and
Sheet 2, Rev. A

Drawings given in Appendix IV of application.

(b) Contents

(1) Type and form of material

Hot-pressed solid plutonium oxide in 24 Fuel Sphere Assemblies (FSA) as the primary containment within secondary packagings of a Heat Source Assembly (HSA) and a Storage Protection Container (SPC).

(2) Maximum quantity of material per package

A total plutonium content not to exceed 5.3 kg, of which not more than 20 w/o may consist of Pu-239, Pu-241 or any combination of those nuclides. The maximum content weight, including the HSA and SPC, not to exceed 300 pounds with a total decay heat not to exceed 2,430 watts.

(c) Fissile Class

II

Minimum transport index to be shown on label

0.3

6. The MHW-IHS-SC shipping container must be filled with helium gas to the equivalent of approximately 7 psig at 200°F. The MHW-IHS-SC shipping container must be equipped with a pressure relief valve set at 33±3 psig which must be tested initially and annually thereafter.
7. The valve on the Storage Protection Container (SPC) must be closed prior to delivery to a carrier for transport. The SPC must be leak tested in accordance with the American National Standard N 14.5 prior to delivery to a carrier for transport.

Page 3 - Certificate No. 9503 - Revision No. 4 - Docket No. 71-9503

8. The shipping container must meet the Quality Control specified in Section J of the Application.
9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
10. Expiration date: January 31, 1987.

REFERENCE

Monsanto Research Corporation's Safety Analysis Report No. MLM-2074 dated June 28, 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

SEP 06 1983

Date: _____

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9510	0	USA/9510/B(U)	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87115

d. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Monsanto Research Corporation Report No.
MLM-2857, "Safety Analysis Report for Packaging
General Purpose Heat Source Module 750 Watt
Shipping Container," October 15, 1981.

e. DOCKET NUMBER 71-9510

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.: General Purpose Heat Source Container (GPHS)
- (2) Description

A cubic shipping cage 38 inches on each side. It is a welded steel structure consisting of a pallet (base), frame, and wire mesh. The cage (carrier) encloses a stainless steel, aluminum finned cask which is less than 19 inches high and has a 25-1/4-inch diameter across the fin tips. Three inner containers called the Stainless Steel Cans (S.S.C.) are stacked on top of each other inside the finned cask. The S.S.C.'s hold the General Purpose Heat Source (GPHS) inside. Each S.S.C. is a completely welded 304 stainless steel cylinder made of a 6-inch diameter by 0.120 wall by 4-1/2-inch high tubing with a base plate of 6-inch diameter by 0.125-inch thick and a cover plate 5-7/8-inch diameter by 0.125-inch thick. The package gross weight is approximately 1100 pounds.

(3) Drawings

Packaging is constructed in accordance with Figures 1, 2, 3, 4, 5, 6, and 16 (Monsanto Report No. MLM-2857, October 1981); and Monsanto Research Corporation Drawings No. AYD790452, Issue B, sheets 1 and 2; and No. F5018877, Issue A.

Page 2 - Certificate No. 9510 - Revision No. 0 - Docket No. 71-9510

5. (b) Contents

(1) Type and form of material

General purpose heat source (GPHS) Modules, containing ^{238}Pu solid oxide. The overall dimensions of a module are 2.14 inches by 3.71 inches by 3.81 inches. Each fuel pellet is contained in a vented iridium capsule, and two of the iridium capsules are enclosed in a single impact shell, which is enclosed in two layers of pyrolytic graphite. Two of these pyrolytic graphite-enclosed impact assemblies are held in a re-entry member.

(2) Maximum quantity of material per package

Pu-238 not to exceed 1360 gm. Maximum of three GPHS's. Maximum total heat 750 watts.

(c) Fissile Class

I

6. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
7. Expiration date: July 31, 1988.

REFERENCES

Monsanto Research Corporation, Report No. MLM-2857, October 15, 1981.

DOE supplements: Received April 18, 1983, dated September 9, 1983.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 23 1983

Date: _____

**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
9781	3	USA/9781/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

Safety Analysis Report for M-160 Shipping
Container dated October 18, 1968, as
supplemented.

71-9781

c. DOCKET NUMBER

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.: M-160
- (2) Description

The packaging consists of a containment vessel which is a right circular cylinder, 79 inches in diameter by 199 inches overall height, which holds the spent fuel blankets or assemblies during shipment. The container outer shell consists of 84 evenly spaced vertical fins 15 1/2 inches long, attached to a 1 1/2-inch thick wall (fabricated from carbon steel and clad with stainless steel on the outer surface). The inner shell, the containment vessel, is 1-inch thick (having a 1/8-inch thick rollbonded stainless steel cladding) whose base is 7 inches thick. The 9-7/16-inch annulus between the outer and inner shells is filled with lead. The top of the container is covered with a rotatable closure head fabricated of stainless steel 15 inches thick which is bolted to the container and seals the containment vessel. An oblong access plug in the cover allows for individual spent fuel cell loading or unloading.

The containment vessel has an inside diameter of 55 inches. The central region contains a secondary heat exchanger which is supported by the closure head. (This heat exchanger is not used during shipment.) An inner backup cylinder, 21 inches in diameter, occupies the central region of the containment vessel. The annulus between the backup cylinder and the inner shell of the containment vessel provides a

Page 2 - Certificate No. 9781 - Revision No. 3 - Docket No. 71-9781

5. (a) Packaging (continued)

(2) Description (continued)

space 17 inches wide by 160 inches high for spent fuel. The spent fuel is contained in the annulus by aluminum module holders designed for the particular spent fuel to be shipped.

The container has external penetrations to the containment vessel for a steam and water vent line, which is capped during shipment. Shipments are by rail. The container is cradled in a support which permits the container to be nearly horizontal during shipment. The maximum loaded shipping weight is 237,000 pounds.

(3) Drawings

The packaging is constructed in accordance with the description and Drawing Nos. contained in the Bettis Atomic Power Laboratory Safety Analysis Reports (WAPD-OP(R)C-243, WAPD-OP(R)C-558 and WAPD-OP(R)C-621 dated May 1973, October 1, 1976 and March 1977.

(b) Contents

(1) Type and form of material

Irradiated fuel assemblies and blanket modules of the following type

- (i) PWR Core 2 Seed 1 Fuel Assembly.
- (ii) PWR Core 2 Seed 2 Fuel Assembly.
- (iii) PWR Core 2 Blanket Fuel Assembly.
- (iv) S5G Fuel Module, rodDED or unrodDED.
- (v) S5G Center Cell.

All shipments shall be made dry and shall use one holddown device per PWR module. Each PWR Core 2 Seed 1 or Seed 2 fuel assembly shall contain a poison rod or a control rod.

(2) Maximum quantity of material per package

- (i) 12 fuel assemblies as described in 5(b)(1)(i) or 11 fuel assemblies and one specific blanket fuel assembly, Serial No. G2A-W01-67. Shipment shall not be made prior to 1,614 days after last power operation of the fuel and shall not exceed 12,846 Btu/hr of decay heat per shipment.
- (ii) 12 fuel assemblies as described in 5(b)(1)(ii) which shall not exceed 1,100 Btu/hr per fuel assembly of decay heat or 13,200 Btu/hr per shipment.
- (iii) 12 blanket fuel assemblies as described in 5(b)(1)(iii) which shall not exceed 21,300 Btu/hr of decay heat per shipment. Shipment shall not be made prior to 1,123 days after last power operation of the fuel.

Page 3 - Certificate No. 9781 - Revision No. 3 - Docket No. 71-9781

(b) Contents (continued)

(2) Maximum quantity of material per package (continued)

- (iv) 8 fuel assemblies as described in 5(b)(1)(ii) and 4 specific blanket fuel assemblies, Serial Numbers G2A-F01-26B, G2A-F01-02, G2A-F01-10 and G2A-W01-73, which shall not exceed 12,016 Btu/hr of decay heat per shipment. Shipment shall not be made prior to 1,487 days after last power operation of the fuel, with the four blanket fuel assemblies located adjacent to each other in a clockwise or counter-clockwise direction as specified by the serial numbers previously stated.
- (v) 4 fuel assemblies as described in 5(b)(1)(iv) or 3 fuel assemblies and one center cell as described in 5(b)(1)(v). Shipment shall not be made prior to 168 days after last power operation of the fuel rod and shall not exceed 12,800 Btu/hr of decay heat per shipment.

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

6. Expiration date: January 31, 1988.

REFERENCES

Safety Analysis Report for M-160 Shipping Container: Core Independent Analyses, SRSD-106, dated October 18, 1968, as transmitted by Naval Reactors Letter G#2097, dated June 3, 1969.

Supplements: Knolls Atomic Power Laboratory letter ONP-74520-414, dated November 26, 1969; Naval Reactors letter G#3742, dated May 15, 1973; Bettis Atomic Power Laboratory letters WAPD-OP(R)C-284, dated August 23, 1973 and WAPD-OP(R)C-297, dated October 8, 1973; Naval Reactor letters G#5582, dated December 17, 1976; G#5671, dated April 15, 1977; G#5702, dated May 23, 1977; G#5792, dated September 22, 1977; G#5793, dated September 29, 1977; G#5872, dated December 20, 1977; G#5897, dated January 11, 1978, and G#6658, dated April 14, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1983

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
9783	2	USA/9783/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

Safety Analysis Report for S5W ITR
Shipping Container dated October 15, 1973,
as supplemented

c. DOCKET NUMBER 71-9783

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.: S5W ITR
- (2) Description

The S5W ITR shipping container is designed to house two, S5W Core 2 or Core 3 interpass thermocouples or one S3W/S4W Core Water Temperature thermocouple. The container is used during removal of the irradiated thermocouples from a reactor vessel. After the interpass thermocouples are properly enclosed and sealed within the shipping container, the container is assembled to the shipping structure. The S5W ITR shipping container is nearly cylindrical vessel, approximately 17-1/2 feet long and 2 feet, 2 inches in diameter, with a carbon steel outer shell with two interior axially located stainless steel tubes (3-1/2 inches diameter Schedule 80 pipe). The annular void between the exterior shell and the interior tubes is filled with poured chemical lead. The lead provides the necessary shielding to protect personnel from radiation during the removal process and during shipment. The fin-shaped steel plates are welded to opposite sides of the container. They provide constant support of the container and provide a constant flat surface for bolting the container to the shipping structure. Two lifting holes are provided in the upper end of the support plates and are

used to raise the shipping container to the vertical for thermocouple loading or unloading. Three lifting lugs are provided for handling either the container or the container and the shipping structure. A lead-filled door, supported on ball bearings, provides an opening through which the thermocouples can be drawn into, or lowered from, the container. Rotating and locking the door at a position 90° from open provides the necessary shielding. Two holddown plugs, located at the top end of the container, grip the top of the thermocouples and position them in the tubes. A lead-filled end cap retains the holddown plugs.

The shipping structure is fabricated from two, 12-inch carbon steel structural channels, weighing 20.7 lbs/ft, joined together at the bottom flange by five carbon steel plates and ten structural supports welded to the internal faces of the channels and the container support plates. The thermocouple container support plates and the shipping structure are held together with twenty-four, 1-1/4-7UNC commercial grade bolts and nuts. Two, one-inch dowel pins affixed to the upper flanges of the shipping structure, guide and locate the thermocouple container onto the shipping structure. The assembled container and shipping structure has an approximate weight of 16,000 lbs.

(3) Drawings

The packaging is constructed in accordance with the description and drawings contained in Bettis Atomic Power Laboratory Safety Analysis Report (WAPD-OP(R)C-256) dated October 15, 1973.

(b) Contents

(1) Type and form of material

Irradiated solid material of the following form,

- (i) S5W interpass thermocouples of either Core 2 or Core 3 type, irradiated for not more than two core lives.
- (ii) S3W/S4W core water temperature thermocouple, irradiated for not more than three core lives.

(2) Maximum quantity of material per package

- (i) Two irradiated assemblies as described in 5(b)(1)(i), not to exceed 1,300 curies. Shipment shall not be made sooner than 30 days after reactor plant shutdown.

Page 3 - Certificate No. 9783 - Revision No. 2 - Docket No. 71-9783

- (ii) One irradiated assembly as described in 5(b)(1)(ii), not to exceed 2,550 curies. Shipment shall not be made sooner than 150 days after reactor plant shutdown.

6. Expiration date: February 29, 1988.

REFERENCES

Safety Analysis Report for S5W ITR shipping container, WAPD-OP(R)C-256, dated October 15, 1973.

Supplements: Bettis Atomic Power Laboratory letters WAPD-OP(R)C-350 dated May 23, 1974, WAPD-OP(R)C-584 dated December 10, 1976 and WAPD-OP(R)C-605 dated January 13, 1977.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

SEP 06 1983

Date: _____

**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
9784	3	USA/9784/B()F	1	2

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
U.S. Department of Energy Division of Naval Reactors Washington, DC 20585	Bettis Atomic Power Laboratory application dated November 2, 1973, as amended.

c. DOCKET NUMBER

71-9784

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.: LWBR New Fuel
- (2) Description

The LWBR New Fuel shipping container is a right circular cylinder 51 inches in diameter and 300 inches long. The outer container consists of a 3/16 inch thick shell with eleven circumferential stiffeners distributed along its length. The outer container is made in two halves with a longitudinal closure flange capable of being sealed using an O-ring gasket. The outer container is attached to a support structure which holds the container and strongbacks on the transport trailer at a 13% slope. Inside the outer container are four support plates for attaching either of two strongbacks. One of the strongbacks is designed to contain the LWBR movable fuel assembly and the other is designed to contain any one of the three types of blanket (stationary) fuel assemblies. The total weight of the outer container, movable fuel strongback, and fuel assembly is 16,600 lbs and the total weight of the outer container, blanket strongback, and Type III blanket assembly is 37,400 lbs (max. weight).

Page 2 - Certificate No. 9784 - Revision No. 3 - Docket No. 71-9784

5. (a) Packaging (Continued)

(4) Drawings

The packaging is constructed in accordance with the drawings contained in Westinghouse Electric Corporation document WAPD-LC(CEM)-65, Rev. B, dated August 16, 1974.

(b) Contents

(1) Type and form of material

Unirradiated fuel assembly enriched in U-233.

(2) Maximum quantity of material per package.

One fuel assembly of the following type and fissile material limit.

<u>Movable Assembly</u>	<u>Blanket Assembly</u>		
	<u>Type I</u>	<u>Type II</u>	<u>Type III</u>
16.39 Kg	15.97 Kg	24.66 Kg	29.46 Kg

(c) Fissile Class

III

Maximum number of packages per shipment

One (1)

6. Expiration date: October 31, 1987.

REFERENCES

Bettis Atomic Power Laboratory application, WAPD-LC(CEM)-64, dated November 2, 1973.

Supplements dated: Bettis Atomic Power Laboratory letters WAPD-LC (CEM)-131, dated February 15, 1974 and WAPD-LD(RL)-87, dated August 16, 1974.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

SEP 06 1983

Date: _____

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

1. a. CERTIFICATE NUMBER 9788	b. REVISION NUMBER 1	c. PACKAGE IDENTIFICATION NUMBER USA/9788/B()L	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 2
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions"
- 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. PREPARED BY (Name and Address)

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

Deactivated S5W Reactor Compartment Safety
Analysis Report for packaging dated July 1981

71-9788

c. DOCKET NUMBER

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.: S5W Reactor Compartment
- (2) Description

The package consists of the deactivated and defueled S5W Reactor Compartment which has been separated from the remainder of the submarine hull and prepared for shipment by sealing all openings and attaching structural pads for handling and tie-down. The package is approximately 37 feet long and approximately cylindrical with a maximum diameter of 33 feet. The reactor compartment itself is between bulkheads. There is an overhang of the hull structure beyond the bulkheads at both ends of the package. Various potentially radioactive components attached to the after bulkhead are enclosed within a sealed cover during shipment. All other radioactive material in the package is within the reactor compartment. All penetrations to the compartment are sealed. The hull is constructed of HY-80 steel and the bulkheads are HY-80 or HT steel. Maximum weight of the package is approximately 2,016,000 pounds. The deactivated reactor plant remains in place within the compartment during shipment. The plant is defueled and drained except for small inaccessible pockets of water. The ion exchanger resin is removed. Potentially contaminated components and piping from other locations in the ship may be placed within the compartment and secured.

5. (a) (3) Drawings

The package is constructed in accordance with the drawings, figures, and sketches included in the application document (see Reference, below).

(b) Contents

Activated structural components associated with the reactor and plant piping, and other miscellaneous components contaminated with radioactive corrosion products (crud). Approximately 50 gallons of contaminated water may also be present in the package.

6. The package may not be shipped until at least 365 days after final reactor shutdown.

7. Expiration date: May 1, 1988.

REFERENCE

Deactivated S5W Reactor Compartment Safety Analysis Report for Packaging, WAPD-REO(c)-250, dated July 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
 Charles E. MacDonald, Chief
 Transportation Certification Branch
 Division of Fuel Cycle and
 Material Safety, NMSS

Date: SEP 06 1987

**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
9852	2	USA/9852/B()F	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address)

U.S. Department of Energy
P.O. Box E
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Oak Ridge Y-12 Plant Reports No. Y/DD-244,
January 1978; and No. Y/LA-810, Rev. 1,
June 1981, as supplemented.

c. DOCKET NUMBER

71-9852

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. DT-14
- (2) Description

Packaging for uranium enriched in the U-235 isotope. The steel containment vessel has a 6-1/2-inch ID and 15-1/2-inch deep cavity. Positive closure is provided by a breech lock closure or a flanged and bolted arrangement. The closures are sealed by Neoprene O-rings. The containment vessel is centered and supported by cane fiberboard within an 18-gage DOT Specification 17H 30-gallon drum. The cane fiberboard insulation has a minimum 14 lb/ft³ density. Plywood discs, 1/4-inch thick are located at the ends of the container. The overall container size is 18-inches diameter by 30-inches high. The package gross weight is 210 pounds.

(3) Drawings

The packaging is constructed in accordance with the drawings shown in Figures 1, 2, and 3 of Oak Ridge Y-12 Plant Report No. Y/DD-244, January 1978.

Page 2 - Certificate No. 9852 - Revision No. 2 - Docket No. 71-9852

5. (b) Contents

(1) Type and form of material

Uranium as metals, alloys, compounds, mixtures, or solutions enriched to any degree in the U-235 isotope. The U-233 isotope not to exceed 1.0 w/o of the U-235.

(2) Maximum quantity of material per package

Not to exceed 10 watts internal decay heat. Maximum content weight within the containment vessel not to exceed 30 kg, the U-235 density not to exceed 18.76 g/cm³, and contents are further restricted as follows:

	Maximum U-235 Mass (kg)			Other U-235 Bearing Material
	Solid Metals Or Alloys V/S* ≥ 0.17-inch	V/S* ≥ 0.08-inch	V/S* ≥ 0.02-inch	
(i)	10.0	10.0	5.0	0.30
(ii)	14.5	11.4	---	0.45
(iii)	18.0	---	---	0.58
(iv)	---	---	---	0.70
(v)	---	---	---	0.75
(vi)	---	---	---	0.85
(vii)	---	---	---	1.00

* V/S is the volume to surface area ratio.

(c) Fissile Class II and III

For contents described in 5(b)(1) and limited in:	Minimum Transport Index to be shown on label for Fissile Class II	Maximum No. of packages per shipment for Fissile Class III
5(b)(2)(i)	0.1	150
5(b)(2)(ii)	0.3	150
5(b)(2)(iii)	0.6	150
5(b)(2)(iv)	1.0	100
5(b)(2)(v)	1.4	70
5(b)(2)(vi)	2.3	40
5(b)(2)(vii)	5.0	20

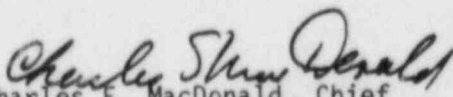
Page 3 - Certificate No. 9852 - Revision No. 2 - Docket No. 71-9852

6. Up to 120 grams of packaging material may be interstitially used for metal pieces; however, when greater packaging material masses are used, the restrictions in 5(b)(2) for other U-235 bearing material shall be used.
7. Uranium hydrides with densities greater than 4.55 g/cm^3 are not permitted.
8. Metals or alloys in solid form must be held within the containment cavity in metal cans with nominal wall thickness of 0.254-mm (10 mils).
9. Powders must be packaged in a water-tight polyethylene bottle with a 1-mm minimum wall thickness. Before loading, the lid on the polyethylene bottle must be visibly inspected to ensure the gasket is present and functional. Each loaded polyethylene bottle must be inverted and hand shaken; a smear must be taken and checked with an alpha detector to ensure non-leakage of the powder. If all of these conditions are satisfied, the lid must be sealed and closed using pressure-sensitive tape.
10. Solutions must be packaged in a water-tight polyethylene bottle with a 1-mm minimum wall thickness. Before loading, the lid on the polyethylene bottle must be visibly inspected to ensure the gasket is present and functional. Each filled polyethylene bottle must be inverted and observed for five minutes. If no leakage is visible, a smear must be taken and checked with an alpha detector to ensure non-leakage of the solution. If all of these conditions are satisfied, the lid must be sealed using pressure-sensitive tape.
11. Upon receipt and prior to the first use of each new package, the containment vessel must be leak tested to $1 \times 10^{-7} \text{ atm-cm}^3/\text{sec}$ at standard test conditions of ANSI N14.5.
12. Containment vessels must be leak tested to $1 \times 10^{-7} \text{ atm-cm}^3/\text{sec}$ at standard test conditions of ANSI N14.5 after the third usage, and within one year from the last inspection date thereafter, prior to use.
13. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
14. Expiration date: October 31, 1986.

REFERENCES

Oak Ridge Y-12 Plant Reports No. Y/DD-244, January 1978, and No. Y/LA-810, Rev. 1, June 1981; and DOE, Oak Ridge Operations Office letter dated August 26, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 18 1983

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES**

U.S. NUCLEAR REGULATORY COMMISSION

1 a. CERTIFICATE NUMBER 9853	b. REVISION NUMBER 4	c. PACKAGE IDENTIFICATION NUMBER USA/9853/B()F	d. PAGE NUMBER 1	e. TOTAL NUMBER PAGES 3
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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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):

Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for Packaging:
The Unirradiated Fuel Shipping Container,
as supplemented.

c. DOCKET NUMBER **71-9853**

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 Nos.:

ORNL Unirradiated Fuel Shipping Container,
BNL Unirradiated Fuel Shipping Container, or
NBS Unirradiated Fuel Shipping Container,

(2) Description

A right cylindrical stainless steel drum enclosing a fuel basket provided with seven (7) cavities. The outer shell and lid are fabricated from eleven (11) gauge plate and the base is 1/4" thick plate. The outer lid is held in place by six (6), 5/8" bolts (stainless steel) and nuts (carbon steel). The basket is fabricated from 16 gauge stainless steel and the base is fabricated from eleven (11) gauge stainless steel plate. Eight (8), 3/8" bolts and nuts retain the basket lid (0.125" thick aluminum) in place.

The basket is supported on 2" by 6" timbers inside the outer shell. The remaining space around the basket is filled with phenolic foam insulation.

Page 2 - Certificate No. 9853 - Revision No. 4 - Docket No. 71-9853

5. (a) Packaging (continued)

<u>Item</u>	<u>ORNL</u>	<u>BNL</u>	<u>NBS</u>
Outside dimension, in	24-1/2	24-1/2	26
Container length, in	56-5/8	75-1/2	87-1/8
Base, in	29 x 29	29 x 29	30-1/2 x 30-1/2
Inside cavity cross section, in	4 x 4	4 x 4	4-1/2 x 4-1/2
Inside cavity length, in	39-1/4	58-1/8	69-11/16
Gross weight, lb	580	700	850

(3) Drawings

The packaging is constructed in accordance ORNL Drawing Nos.:

ORNL Container - X3E-10191-002, Rev. B,
X3E-10191-003, Rev. B,
DS-XDE-10191-1, Rev. 1;

BNL Container - X3E-10191-010, Rev. B,
X3E-10191-011, Rev. B;
DS-XDE-10191-2, Rev. 1; or

NBS Container - X3E-10191-100, Rev. C,
X3E-10191-101, Rev. D,
DS-XDE-10191-3, Rev. 1.

(b) Contents

(1) Type and form of material

Unirradiated uranium fuel element enriched in the U-235 isotope composed of aluminum plates.

(2) Maximum quantity of material per package

ORNL-BNL Container -

Seven (7) fuel elements containing 370 grams U-235 per fuel element.

NBS Container -

Seven (7) fuel elements containing 370 grams U-235 per fuel element; or, two (2) fuel elements containing 210 grams U-235 per fuel element and four (4) fuel elements containing 841 grams U-235 per fuel element.

Page 3 - Certificate No. 9853 - Revision No. 4 - Docket No. 71-9853

(c) Fissile Class

I

6. The fire resistant phenolic foam shall be in accordance with AEC Materials and Equipment Specification SP-9 or as modified by ORGDP Reports K/TL-729 and K/P-6567S.
7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.
8. Expiration date: October 31, 1989.

REFERENCES

Safety Analysis Report for Packaging: The Unirradiated Fuel Shipping ORNL/ENG/TM-15, September 1979.


Nuclear Criticality Safety Assessment of ORR, NBS, HFBR Fuel Element Shipping Package, J. T. Thomas, ORNL/CDS/TM-77.

Union Carbide letter dated September 10, 1979.

ORNL letter dated September 18, 1979.

Department of Energy letters dated: November 1, 1979; and February 21 and April 4, 1980.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: OCT 25 1984

**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
9901	2	USA/9901/B()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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):	b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Westinghouse Hanford Company P.O. Box 1970 Richland, WA 99352	Hanford Engineering Development Laboratory Report No. HEDL-TI 76-018, December 1976.
c. DOCKET NUMBER 71-9901	

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.: Model 120
- (2) Description

A metal "birdcage" enclosing a steel containment vessel for unirradiated fuel pins. The stainless steel containment vessel is a 12-inch diameter, 154-inch long, Schedule 40 pipe. One end is closed with a 1.25-inch thick cover plate, secured with sixteen 1-inch diameter bolts to a welded neck-type flange. The containment seal is a Flexitallic type-spiral wound, stainless steel, asbestos filler gasket.

The containment vessel is centered inside of a prismatic metal frame 21.5 x 21.5 x 190 inches, and is supported by six, 5/16-inch thick and two, 1-1/4-inch thick steel plates equally spaced and welded to the support frame perpendicular to the longitudinal axis. The support frame is constructed of 2- x 2- x 1/4-inch steel angles, covered with expanded metal mesh. Impact limiters comprised of interspersed styrofoam and masonite are bolted to the ends. The package gross weight is 2,200 pounds.

Page 2 - Certificate No. 9901 - Revision No. 2 - Docket No. 71-9901

5. (a) Packaging (Cont'd)

(3) Drawings

The packaging is fabricated in accordance with Hanford Engineering Development Laboratory Drawing Nos. H-3-37350, Sheet 1, Rev. 4, Sheet 2, Rev. 2, Sheet 3, Rev. 3, Sheet 4, Rev. 2; H-3-39691, Sheet 1, Rev. 1, Sheet 2, Rev. 0; H-3-32429, Sheet 3 of 4, Rev. 6; H-3-38062, Rev. 1; H-3-37042, Rev. 1; and H-3-37412, Rev. 1.

(b) Contents

(1) Type and form of material

- (i) Unirradiated fuel pins containing mixed
- PuO_2
- in natural
- UO_2
- as pressed sintered pellets of the following specification:

Pellet diameter, inch	0.19 to 0.20
Pin diameter, inch	0.22 to 0.24
Maximum length, inches	36.3
Maximum PuO_2 in UO_2 , w/o	31
Maximum U-235 enrichment in UO_2 , w/o	0.72
Minimum Pu-240 enrichment in PuO_2 , w/o	10
Cladding material	Type 304 SS or 316 SS
Minimum cladding thickness, inch	0.010

- (ii) Unirradiated fuel pins containing mixed
- PuO_2
- in
- UO_2
- enriched to any degree in the U-235 isotope as solid pellets of the following specification:

Maximum pin diameter, inch	0.290
Maximum length, inch	37
Minimum Pu-240 enrichment in PuO_2 , w/o	10

Page 3 - Certificate No. 9901 - Revision No. 2 - Docket No. 71-9901

5. (b) Contents (Cont'd)

Cladding material	Type 304 SS or 316 SS
Minimum cladding thickness, inch	0.010
Maximum linear density of fissile material, kg/ft	3.0

- (iii) Fast flux test facility (FFTF) fuel.
 - (iv) PuO₂ and UO₂ enriched in the U-235 isotope encapsulated in fuel pins or capsules which meet the requirements of special form radioactive material.
 - (v) Solid dry oxides of Pu-238, Pu-239, Pu-240, Pu-241 (non-isolated form), U-233, U-235, Np-237 and Am-241, contained within capsules which meet the requirements of special form radioactive material.
 - (vi) Pu-241, Am-242, Cm-243, Cm-244, Cm-245, Cf-247 or Cf-251 in any form, contained in capsules which meet the requirements of special form radioactive material.
- (2) Maximum quantity of material per package
- Not to exceed 260 watts internal decay heat, and:
- (i) For the contents described in 5(b)(1)(i) and 5(b)(1)(ii) 120 fuel pins with no more than 6.75 kg Pu.
 - (ii) For the contents described in 5(b)(1)(iii) no more than one assembly.
 - (iii) For the contents described in 5(b)(1)(iv), greater than Type A quantity of radioactive material not to exceed the generally licensed mass limits as specified in 10 CFR § 71.22.
 - (iv) For the contents described in 5(b)(1)(v) no more than 230 grams of fissile material.
 - (v) For the contents described in 5(b)(1)(vi) no more than 3 grams of the isotopes specified.

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(c) Fissile Class

II and III

(1) Minimum transport index to be shown on label for Class II

- | | |
|--|-----|
| (i) For contents described in 5(b)(1)(i) and limited in 5(b)(2)(i): | 4.0 |
| (ii) For contents described in 5(b)(1)(ii) and limited in 5(b)(2)(i): | 7.0 |
| (iii) For contents described in 5(b)(1)(iii) and limited in 5(b)(2)(ii): | 0.5 |
| (iv) For contents described in 5(b)(1)(v) and limited in 5(b)(2)(iv): | 3.5 |
| (v) For contents described in 5(b)(1)(vi) and limited in 5(b)(2)(v): | 3.5 |

(2) Maximum number of packages per shipment for Class III

For contents described in 5(b)(1)(iv) and limited in 5(b)(2)(iii): One (1)

- For the contents described in 5(b)(1)(i), (ii), (iv) and (v) carbides or nitrides may replace the oxides of uranium and plutonium.
- The package authorized by this certificate is hereby approved for use under general license provisions of 10 CFR §71.12.
- Expiration date: May 31, 1988.

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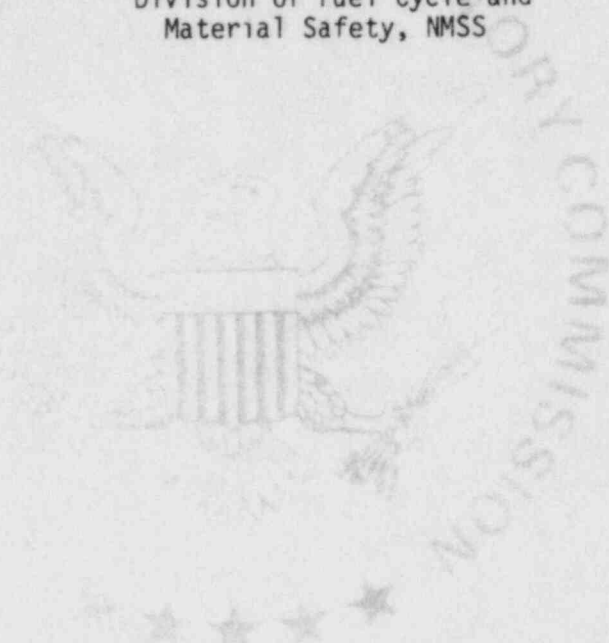
REFERENCE

Hanford Engineering Development Laboratory Report No. HEDL-TI 76-018, December 1976.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



**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
9964	3	USA/9964/B()	1	3

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 of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."
- 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. PREPARED BY (Name and Address):
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

E. I. duPont de Nemours & Company
Savannah River Plant
Aiken, SC 29801

E.I. duPont de Nemours & Company
Report No. DPSPU 74-124-3, January 1975.

c. DOCKET NUMBER 71-9964

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.: LP-12-1

(2) Description

Packaging for large quantities of tritium. The containment vessel is a nominal one (1) liter stainless steel bottle fitted with a vacuum valve assembly. The primary containment vessel has a 4-inch OD, is 5-3/4 inches high and has 1/8-inch thick walls. It is supported by a hold-down assembly within a nominal 12 liter aluminum bucket, with a 10-inch OD; 18.2-inch height and 0.19-inch walls. The bucket is centered and supported within an 18-gauge, 19-1/4-inch OD by 28-5/8-inch steel drum using Celotex insulation. The drum is closed using a bolted locking ring. The package gross weight is 140 pounds.

(3) Drawings

The packaging is fabricated in accordance with DuPont Drawing Nos.: S5-2-7145, Rev. 0; S5-2-7146, Rev. 0; S5-2-7142, Rev. 0; S5-2-7143, Rev. 0; S5-2-7144, Rev. 0; and S4-2-147; and DuPont Detail 146770 and Nuclear Products Company Drawing No. S5-8BG-TSW.

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5. (b) Contents

(1) Type and form of material

Tritium gas in mixture with other gases.

(2) Maximum quantity of material per package

Not more than 1,121 cm³ of tritium at STP (1 atm, 25°C) and a maximum activity of 2,881 curies.

6. The maximum internal fill pressure of the primary containment vessel at loading shall not exceed 19.3 psia at 25°C (77°F).

7. Each packaging, before first use, and after the third use shall be leak tested to show that the containment vessel maximum helium leak rate will not exceed 7×10^{-8} atm-cm³/sec when the containment vessel is filled to 47 psia and tested in an ambient environment of 14.7 psia. In addition, the primary containment vessel shall have been leak tested as described above, prior to use, within the preceding 12 month period.

8. Before each use the primary containment vessel and closure valve shall be leak tested in accordance with the procedures described below:

(a) The primary containment vessel is evacuated and a rate of rise determination is made at 50 microns of pressure. The rate of rise shall be less than 1 micron for a 10 minute test period.

(b) After filling the primary containment vessel with its contents the valve closure shall be determined by a pressure rise test. A rise of 8 microns or less over a 20 minute test period into a cavity with 20 microns pressure shall be considered acceptable.

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

10. Expiration date: September 30, 1987.

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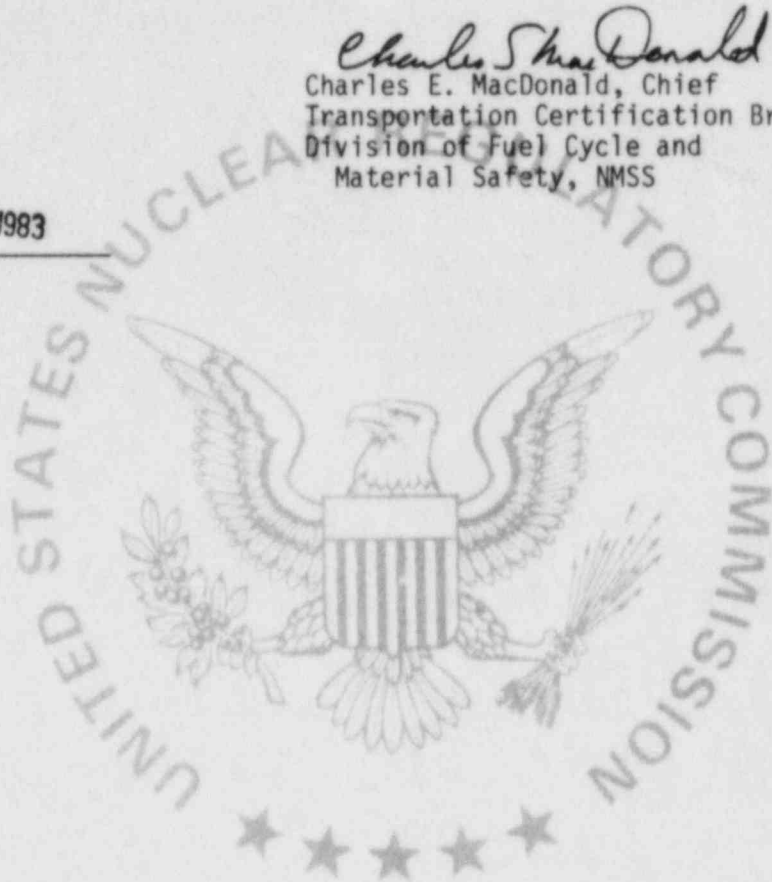
REFERENCE

E. I. duPont de Nemours and Company Report No. DPSPU-74-124-3, January 1975.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Date: SEP 06 1983



U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

TYPE OF PACKAGING IS: BYPROD. NORM. FORM

MODEL NO.:	BCL-2	USA/9068/B()F	EXP. DATE:	09/30/86
MODEL NO.:	BCL-3	USA/9067/B()F	EXP. DATE:	09/30/86
MODEL NO.:	BCL-4	USA/5950/B()F	EXP. DATE:	09/30/86
MODEL NO.:	GAS CYL FIRE	USA/5552/B()	EXP. DATE:	07/31/88
MODEL NO.:	LP-12	USA/6677/B()	EXP. DATE:	09/30/87
MODEL NO.:	LP-12-1	USA/9964/B()	EXP. DATE:	09/30/87
MODEL NO.:	LP-50	USA/6678/B()	EXP. DATE:	09/30/87
MODEL NO.:	NRBK-41	USA/5814/B()F	EXP. DATE:	04/30/85
MODEL NO.:	NRBK-42	USA/5814/B()F	EXP. DATE:	04/30/85
MODEL NO.:	NRBK-43	USA/5814/B()F	EXP. DATE:	04/30/85
MODEL NO.:	NRBK-44	USA/5875/B()F	EXP. DATE:	04/30/85
MODEL NO.:	PAS-1	USA/9184/B(U)	EXP. DATE:	04/30/89
MODEL NO.:	SSW CORE BARREL	USA/5758/B()	EXP. DATE:	03/31/88
MODEL NO.:	SSW ITR	USA/9783/B()	EXP. DATE:	02/29/88
MODEL NO.:	SSW REC. COMPT.	USA/9788/B()L	EXP. DATE:	05/01/88
MODEL NO.:	UCC-20WC-2	USA/9098/B()	EXP. DATE:	09/30/87
MODEL NO.:	UCC-20WC-2A	USA/9098/B()	EXP. DATE:	09/30/87
MODEL NO.:	WAPD-39	USA/5875/B()F	EXP. DATE:	04/30/85
MODEL NO.:	WAPD-40	USA/5874/B()F	EXP. DATE:	04/30/85

U. S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

TYPE OF PACKAGING IS: BYPROD. SPEC. FORM

MODEL NO.:	A-0109	USA/6280/B(1	EXP. DATE:	11/30/84
MODEL NO.:	C-1	USA/9036/B()	EXP. DATE:	07/31/85
MODEL NO.:	C-10	USA/9133/B(U)	EXP. DATE:	05/31/87
MODEL NO.:	C-8	USA/9128/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	CEN. UNI SA	USA/9135/B(U)	EXP. DATE:	04/30/87
MODEL NO.:	CEN. UNIV. S	USA/9135/B(U)	EXP. DATE:	04/30/87
MODEL NO.:	CENTURY S	USA/9135/B(U)	EXP. DATE:	04/30/87
MODEL NO.:	CENTURY SA	USA/9135/B(U)	EXP. DATE:	04/30/87
MODEL NO.:	DA520	USA/9013/B()	EXP. DATE:	05/31/86
MODEL NO.:	DA521	USA/9013/B()	EXP. DATE:	05/31/86
MODEL NO.:	E-MEH-00-00004	USA/9011/B()	EXP. DATE:	03/31/86
MODEL NO.:	F-147	USA/9174/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	GE-1000	USA/9045/B()	EXP. DATE:	07/31/85
MODEL NO.:	GE-1100	USA/9046/B()	EXP. DATE:	07/31/85
MODEL NO.:	GE-1400	USA/9051/B()	EXP. DATE:	07/31/85
MODEL NO.:	GE-400	USA/5998/B()	EXP. DATE:	07/31/85
MODEL NO.:	GE-500	USA/9049/B()	EXP. DATE:	07/31/85
MODEL NO.:	GE-900	USA/9050/B()	EXP. DATE:	07/31/85
MODEL NO.:	GNG-20	USA/9163/B(U)	EXP. DATE:	06/30/88
MODEL NO.:	HUSMAN IRRAD.	USA/9182/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	IR-100	USA/9157/B(U)	EXP. DATE:	07/31/87
MODEL NO.:	IR-50	USA/9156/B(U)	EXP. DATE:	07/31/87
MODEL NO.:	L	USA/5595/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	LWBR NEW FUEL	USA/9784/B()F	EXP. DATE:	10/31/87

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

TYPE OF PACKAGING IS: BYPROD. SPEC. FORM

MODEL NO.:	M	USA/5595/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	MW-3000	USA/9030/B()	EXP. DATE:	07/31/85
MODEL NO.:	MX-IC-100	USA/9110/B()	EXP. DATE:	06/30/88
MODEL NO.:	NATICK IRRADI	USA/5362/B()	EXP. DATE:	10/31/86
MODEL NO.:	NPI-20WC-6	USA/9102/B()	EXP. DATE:	04/30/88
MODEL NO.:	NPI-67-0442	USA/5364/B()	EXP. DATE:	05/31/89
MODEL NO.:	OP-100	USA/9185/B(U)	EXP. DATE:	07/31/87
MODEL NO.:	ORNL TRU	USA/5461/B()	EXP. DATE:	06/30/86
MODEL NO.:	ORNL TRV CALIF	USA/5740/B()	EXP. DATE:	05/31/86
MODEL NO.:	PAS-2	USA/9181/B(U)	EXP. DATE:	03/31/89
MODEL NO.:	PAS-2A	USA/9181/B(U)	EXP. DATE:	03/31/89
MODEL NO.:	RG-1	USA/6703/B()	EXP. DATE:	02/28/85
MODEL NO.:	SENTINEL 1S	USA/9153/B()	EXP. DATE:	10/31/86
MODEL NO.:	SENTINEL 8S	USA/9085/B()	EXP. DATE:	04/30/87
MODEL NO.:	SENTINEL-100F	USA/5862/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25A	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25B	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25C	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25C3	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25D	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25E	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-25F	USA/4888/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-3	USA/9030/B()	EXP. DATE:	07/31/85
MODEL NO.:	SENTINEL-8	USA/9030/B()	EXP. DATE:	07/31/85

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

TYPE OF PACKAGING IS: BYPROD. SPEC. FORM

MODEL NO.:	SNAP 21	USA/5830/B()	EXP. DATE:	07/31/85
MODEL NO.:	SNAP-23ANO.1000	USA/9017/B()	EXP. DATE:	06/30/88
MODEL NO.:	SPEC 2-T	USA/9056/B()	EXP. DATE:	03/31/86
MODEL NO.:	STL-201	USA/9024/B()	EXP. DATE:	02/28/85
MODEL NO.:	URIPS-P-1	USA/5071/B()	EXP. DATE:	07/31/85
MODEL NO.:	URIPS-8A	USA/6786/B()	EXP. DATE:	07/31/85
MODEL NO.:	URIPS-8B	USA/6786/B()	EXP. DATE:	07/31/85
MODEL NO.:	100	USA/9127/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	100A	USA/9127/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	181361	USA/5796/B()	EXP. DATE:	07/31/87
MODEL NO.:	181375	USA/5796/B()	EXP. DATE:	07/31/87
MODEL NO.:	20	USA/9126/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	20-VS	USA/9160/B(U)	EXP. DATE:	04/30/89
MODEL NO.:	20A	USA/9126/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	200	USA/9127/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	200A	USA/9127/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	3206B	USA/9167/B(U)	EXP. DATE:	03/31/88
MODEL NO.:	3218	USA/9167/B(U)	EXP. DATE:	03/31/88
MODEL NO.:	3227B	USA/9167/B(U)	EXP. DATE:	03/31/88
MODEL NO.:	4.5 TON CF	USA/6642/B()	EXP. DATE:	06/30/86
MODEL NO.:	40-VS	USA/9160/B(U)	EXP. DATE:	04/30/89
MODEL NO.:	50	USA/9126/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	50A	USA/9126/B(U)	EXP. DATE:	10/31/88
MODEL NO.:	500-SU	USA/9006/B(U)	EXP. DATE:	01/31/85

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U. S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

PAGE 5

TYPE OF PACKAGING IS: BYPROD. SPEC. FORM

MODEL NO. :	500SU-OP	USA/9180/B(U)	EXP. DATE :	06/30/88
MODEL NO. :	520	USA/9007/B(U)	EXP. DATE :	12/31/85
MODEL NO. :	5979	USA/5979/B()	EXP. DATE :	07/31/85
MODEL NO. :	5984	USA/5984/B()	EXP. DATE :	02/28/85
MODEL NO. :	6-GS-1	USA/6550/B(U)	EXP. DATE :	07/31/88
MODEL NO. :	650	USA/9032/B(U)	EXP. DATE :	06/30/89
MODEL NO. :	660	USA/9033/B(U)	EXP. DATE :	05/31/89
MODEL NO. :	660E	USA/9033/B(U)	EXP. DATE :	05/31/89
MODEL NO. :	6717-B	USA/6717/B(U)	EXP. DATE :	07/31/85
MODEL NO. :	676	USA/9029/B(U)	EXP. DATE :	09/30/89
MODEL NO. :	676E	USA/9029/B(U)	EXP. DATE :	09/30/89
MODEL NO. :	680	USA/9035/B(U)	EXP. DATE :	01/31/85
MODEL NO. :	680E	USA/9035/B(U)	EXP. DATE :	01/31/85
MODEL NO. :	683	USA/9053/B()	EXP. DATE :	07/31/85
MODEL NO. :	684	USA/9028/B(U)	EXP. DATE :	12/31/84
MODEL NO. :	684E	USA/9028/B(U)	EXP. DATE :	12/31/84
MODEL NO. :	702	USA/6613/B(U)	EXP. DATE :	03/31/87
MODEL NO. :	715	USA/9039/B(U)	EXP. DATE :	08/31/85
MODEL NO. :	741	USA/9027/B(U)	EXP. DATE :	01/31/85
MODEL NO. :	741E	USA/9027/B(U)	EXP. DATE :	01/31/85
MODEL NO. :	750	USA/9021/B(U)	EXP. DATE :	07/31/89
MODEL NO. :	770	USA/9148/B(U)	EXP. DATE :	05/31/87
MODEL NO. :	771	USA/9107/B(U)	EXP. DATE :	02/29/88
MODEL NO. :	820	USA/9137/B(U)	EXP. DATE :	01/31/85

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U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: RYPROD. SPEC. FORM

MODEL NO. :	850	USA/9147/B(U)	EXP. DATE:	01/31/86
MODEL NO. :	855	USA/9165/B(U)	EXP. DATE:	12/31/88
MODEL NO. :	858	USA/9154/B(U)	EXP. DATE:	11/30/86
MODEL NO. :	864	USA/9166/B(U)	EXP. DATE:	01/31/88
MODEL NO. :	865	USA/9187/B(U)	EXP. DATE:	03/31/89
MODEL NO. :	900	USA/9141/B(U)	EXP. DATE:	05/31/85
MODEL NO. :	910	USA/9149/B(U)	EXP. DATE:	05/30/86
MODEL NO. :	920	USA/9143/B(U)	EXP. DATE:	02/28/86

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U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: FISSILE URANIUM

MODEL NO.:	ATR	USA/9099/AF	EXP. DATE:	11/30/87
MODEL NO.:	BAPL 5910 BRDCG	USA/9119/B()F	EXP. DATE:	03/31/88
MODEL NO.:	BB-250-1	USA/5517/AF	EXP. DATE:	03/31/85
MODEL NO.:	BB-250-2	USA/5788/AF	EXP. DATE:	09/30/87
MODEL NO.:	BNL UNIR CONT	USA/9853/B()F	EXP. DATE:	10/31/89
MODEL NO.:	BNL UNIRR FUEL	USA/9191/AF	EXP. DATE:	04/30/89
MODEL NO.:	BU-5	USA/6458/AF	EXP. DATE:	04/30/86
MODEL NO.:	BU-6	USA/9018/B()F	EXP. DATE:	06/30/89
MODEL NO.:	BU-7	USA/9019/AF	EXP. DATE:	04/30/89
MODEL NO.:	CE-250-2	USA/9022/AF	EXP. DATE:	06/30/85
MODEL NO.:	DT-14	USA/9852/B()F	EXP. DATE:	10/31/86
MODEL NO.:	DT-2	USA/6227/AF	EXP. DATE:	03/31/87
MODEL NO.:	DT-5	USA/6227/AF	EXP. DATE:	03/31/87
MODEL NO.:	DT-7	USA/6227/AF	EXP. DATE:	03/31/87
MODEL NO.:	D2G POWER UNIT	USA/6441/AF	EXP. DATE:	02/29/88
MODEL NO.:	D34710-1	USA/5088/AF	EXP. DATE:	10/31/85
MODEL NO.:	D34710-2	USA/5088/AF	EXP. DATE:	10/31/85
MODEL NO.:	ETR	USA/9134/B()F	EXP. DATE:	10/31/89
MODEL NO.:	FD	USA/5463/AF	EXP. DATE:	07/31/86
MODEL NO.:	FPD-100	USA/9057/AF	EXP. DATE:	10/31/85
MODEL NO.:	FSV-3	USA/6347/AF	EXP. DATE:	04/30/87
MODEL NO.:	GE-21PF-1	USA/4909/AF	EXP. DATE:	11/30/87
MODEL NO.:	MODEL B	USA/6206/AF	EXP. DATE:	03/31/85
MODEL NO.:	NBS UNIR CONT	USA/9853/B()F	EXP. DATE:	10/31/89

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U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: FISSILE URANIUM

MODEL NO.:	NFP-55	USA/5341/B()F	EXP. DATE:	10/31/89
MODEL NO.:	NFS-URANYL NIT.	USA/5059/AF	EXP. DATE:	09/30/86
MODEL NO.:	NNFD-SA-2	USA/5910/B()F	EXP. DATE:	10/31/89
MODEL NO.:	NNFD-10	USA/6357/B()F	EXP. DATE:	10/31/89
MODEL NO.:	NONE SPECIFIED	USA/6406/AF	EXP. DATE:	06/30/88
MODEL NO.:	ORNL UNIR CONT	USA/9853/B()F	EXP. DATE:	10/31/89
MODEL NO.:	ORNL UNIRR FUEL	USA/9191/AF	EXP. DATE:	04/30/89
MODEL NO.:	PADUCAH TIGER	USA/6553/B()F	EXP. DATE:	06/30/88
MODEL NO.:	RA-2	USA/4986/AF	EXP. DATE:	03/31/87
MODEL NO.:	RA-3	USA/4986/AF	EXP. DATE:	03/31/87
MODEL NO.:	RCC	USA/5450/AF	EXP. DATE:	01/31/86
MODEL NO.:	RCC-1	USA/5450/AF	EXP. DATE:	01/31/86
MODEL NO.:	RCC-2	USA/5450/AF	EXP. DATE:	01/31/86
MODEL NO.:	RCC-3	USA/5450/AF	EXP. DATE:	01/31/86
MODEL NO.:	RCC-4	USA/5450/AF	EXP. DATE:	01/31/86
MODEL NO.:	RMG-172	USA/5754/B()F	EXP. DATE:	09/30/89
MODEL NO.:	RMG-181-I	USA/5492/AF	EXP. DATE:	01/31/88
MODEL NO.:	RMG-184	USA/5687/AF	EXP. DATE:	09/30/87
MODEL NO.:	R1010-0032	USA/6115/AF	EXP. DATE:	09/30/87
MODEL NO.:	S-6213	USA/9186/AF	EXP. DATE:	08/31/87
MODEL NO.:	S1W UNIRR CORE	USA/6385/AF	EXP. DATE:	04/30/88
MODEL NO.:	S3W/S4W NEW SUB	USA/6002/B()F	EXP. DATE:	03/31/88
MODEL NO.:	S5W POWER UNIT	USA/5580/B()F	EXP. DATE:	03/31/88
MODEL NO.:	TRIGA-1	USA/9034/AF	EXP. DATE:	02/28/85

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U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: FISSILE URANIUM

MODEL NO. :	TRIGA-2	USA/9037/AF	EXP. DATE:	02/28/85
MODEL NO. :	UNC-1484	USA/4949/AF	EXP. DATE:	12/31/84
MODEL NO. :	UNC-2500	USA/5641/AF	EXP. DATE:	03/31/86
MODEL NO. :	UNC-2600	USA/5086/AF	EXP. DATE:	05/31/85
MODEL NO. :	UNC-2901	USA/6294/AF	EXP. DATE:	07/31/85
MODEL NO. :	W-21PF-1	USA/4909/AF	EXP. DATE:	11/30/87
MODEL NO. :	11.9 NEW FUEL	USA/6134/B()F	EXP. DATE:	01/31/88
MODEL NO. :	2.7 NEW FUEL	USA/5894/AF	EXP. DATE:	01/31/88
MODEL NO. :	235R001	USA/6386/AF	EXP. DATE:	01/31/88
MODEL NO. :	25.0 SPARE MOD.	USA/6188/B()F	EXP. DATE:	01/31/88
MODEL NO. :	426A	USA/6049/B()F	EXP. DATE:	01/31/88
MODEL NO. :	426B	USA/6049/B()F	EXP. DATE:	01/31/88
MODEL NO. :	48A	USA/6273/AF	EXP. DATE:	11/30/85
MODEL NO. :	48F	USA/6273/AF	EXP. DATE:	11/30/85
MODEL NO. :	48X	USA/6273/AF	EXP. DATE:	11/30/85
MODEL NO. :	48Y	USA/6273/AF	EXP. DATE:	11/30/85
MODEL NO. :	57.5 X 108 CORE	USA/5914/B()F	EXP. DATE:	01/31/88
MODEL NO. :	660B	USA/5563/B()F	EXP. DATE:	10/31/89
MODEL NO. :	660C	USA/5563/B()F	EXP. DATE:	10/31/89
MODEL NO. :	814A	USA/5149/B()F	EXP. DATE:	10/31/89
MODEL NO. :	9189	USA/9189/AF	EXP. DATE:	03/31/89
MODEL NO. :	927A1	USA/6078/AF	EXP. DATE:	06/30/85
MODEL NO. :	927C1	USA/6078/AF	EXP. DATE:	06/30/85
MODEL NO. :	961A	USA/6172/B()F	EXP. DATE:	10/31/89

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LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

PAGE 10

TYPE OF PACKAGING IS: IRRADIATED FUEL

MODEL NO.:	BMI-1	USA/5957/B()F	EXP. DATE:	07/31/85
MODEL NO.:	FSV-1	USA/6346/B()F	EXP. DATE:	09/30/85
MODEL NO.:	GE-100	USA/5926/B()F	EXP. DATE:	12/31/87
MODEL NO.:	GE-1600	USA/9044/B()F	EXP. DATE:	04/30/87
MODEL NO.:	GE-200	USA/5971/B()F	EXP. DATE:	06/30/85
MODEL NO.:	GE-600	USA/5980/B()F	EXP. DATE:	12/31/84
MODEL NO.:	GE-700	USA/5942/B()F	EXP. DATE:	06/30/85
MODEL NO.:	IF-300	USA/9001/B()F	EXP. DATE:	10/31/84
MODEL NO.:	M-130	USA/6003/B()F	EXP. DATE:	05/31/88
MODEL NO.:	M-160	USA/9781/B()F	EXP. DATE:	01/31/88
MODEL NO.:	NAC-1	USA/9183/B()	EXP. DATE:	09/30/89
MODEL NO.:	NLI-1/2	USA/9010/B()F	EXP. DATE:	03/31/85
MODEL NO.:	NLI-10/24	USA/9023/B()F	EXP. DATE:	07/31/86
MODEL NO.:	NLI-6502	USA/9103/B()F	EXP. DATE:	05/31/88
MODEL NO.:	T-2	USA/5607/B()F	EXP. DATE:	03/31/87
MODEL NO.:	T-3	USA/9132/B(M)F	EXP. DATE:	05/31/85
MODEL NO.:	TN-8	USA/9015/B()F	EXP. DATE:	06/30/85
MODEL NO.:	TN-8L	USA/9015/B()F	EXP. DATE:	06/30/85
MODEL NO.:	TN-9	USA/9016/B()F	EXP. DATE:	06/30/85

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LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

PAGE 11

TYPE OF PACKAGING IS: LSA

MODEL NO.:	AP-100	USA/9074/A	EXP. DATE:	03/31/88
MODEL NO.:	BS-33-180	USA/6722/A	EXP. DATE:	11/30/85
MODEL NO.:	CNS 14-170 III	USA/9151/A	EXP. DATE:	06/30/87
MODEL NO.:	CNS 14-195-H	USA/9094/A	EXP. DATE:	05/31/85
MODEL NO.:	CNS 21-300	USA/9096/A	EXP. DATE:	05/31/85
MODEL NO.:	CNS 6-75	USA/9108/A	EXP. DATE:	09/30/88
MODEL NO.:	CNS 6-80-2	USA/9111/A	EXP. DATE:	10/31/88
MODEL NO.:	CNS 6-80-2A	USA/9111/A	EXP. DATE:	10/31/88
MODEL NO.:	CNS 7-100	USA/9080/A	EXP. DATE:	11/30/88
MODEL NO.:	HN-100 SERIES 1	USA/9086/A	EXP. DATE:	03/31/88
MODEL NO.:	HN-100 SERIES 2	USA/9079/A	EXP. DATE:	04/30/88
MODEL NO.:	HN-100 SERIES 3	USA/9151/A	EXP. DATE:	06/30/87
MODEL NO.:	HN-100 2A	USA/9079/A	EXP. DATE:	04/30/88
MODEL NO.:	HN-100S	USA/9089/A	EXP. DATE:	11/30/88
MODEL NO.:	HN-600	USA/9080/A	EXP. DATE:	11/30/88
MODEL NO.:	KKP-20-4950	USA/9100/A	EXP. DATE:	05/31/88
MODEL NO.:	LL-60-150	USA/6568/A	EXP. DATE:	04/30/86
MODEL NO.:	NUPAC 7/100	USA/9178/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 10/140	USA/9177/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 100	USA/9080/A	EXP. DATE:	11/30/88
MODEL NO.:	NUPAC 14/190H	USA/9159/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 14/190L	USA/9159/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 14/190M	USA/9159/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 14/210H	USA/9176/A	EXP. DATE:	03/31/88

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U.S. NUCLEAR REGULATORY COMMISSION
LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: LSA

MODEL NO.:	NUPAC 14/210L	USA/9176/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 14D-2.0	USA/9079/A	EXP. DATE:	04/30/88
MODEL NO.:	NUPAC 50-1.5L	USA/9145/A	EXP. DATE:	02/28/86
MODEL NO.:	NUPAC 50-2.5L	USA/9145/A	EXP. DATE:	02/28/86
MODEL NO.:	NUPAC 50-3.0L	USA/9145/A	EXP. DATE:	02/28/86
MODEL NO.:	NUPAC 50-4.0L	USA/9145/A	EXP. DATE:	02/28/86
MODEL NO.:	NUPAC 6/100H	USA/9179/A	EXP. DATE:	03/31/88
MODEL NO.:	NUPAC 6/100L	USA/9179/A	EXP. DATE:	03/31/88
MODEL NO.:	NUS 14-170 I	USA/9151/A	EXP. DATE:	06/30/87
MODEL NO.:	RAD-WASTE CR.I	USA/9105/A	EXP. DATE:	12/31/88
MODEL NO.:	SGC-1	USA/9144/A	EXP. DATE:	04/30/86
MODEL NO.:	48 H	USA/9090/A	EXP. DATE:	05/31/87
MODEL NO.:	48 HX	USA/9090/A	EXP. DATE:	05/31/87
MODEL NO.:	48 OM	USA/9090/A	EXP. DATE:	05/31/87
MODEL NO.:	589	USA/9139/A	EXP. DATE:	07/31/85

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LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

TYPE OF PACKAGING IS: PU AIR

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MODEL NO.:	PAT-1	USA/0361/B(U)F	EXP. DATE:	08/31/88
MODEL NO.:	PAT-2	USA/9150/B(U)	EXP. DATE:	09/30/86

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LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: PU NORM. FORM

MODEL NO.:	B-3	USA/6058/B()	EXP. DATE:	02/28/85
MODEL NO.:	BETTIS WASTE	USA/6142/B()F	EXP. DATE:	05/31/88
MODEL NO.:	DOT-6M TYPE B	USA/5908/B()F	EXP. DATE:	02/28/86
MODEL NO.:	FL 10-1	USA/9009/B()F	EXP. DATE:	05/31/89
MODEL NO.:	GE-8500	USA/6697/B()	EXP. DATE:	02/28/85
MODEL NO.:	GPHS	USA/9510/B(U)	EXP. DATE:	07/31/88
MODEL NO.:	MHW-IHS-SC	USA/9503/B()F	EXP. DATE:	01/31/87
MODEL NO.:	N-55	USA/9070/B()F	EXP. DATE:	05/31/87
MODEL NO.:	SL-10-:	USA/9020/B()F	EXP. DATE:	03/31/85
MODEL NO.:	6400	USA/6400/B()F	EXP. DATE:	11/30/86
MODEL NO.:	6679	USA/6679/B()F	EXP. DATE:	02/28/89

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LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: PU SPEC. FORM

MODEL NO.:	D-38	USA/5787/B()F	EXP. DATE:	07/31/87
MODEL NO.:	GE-1500	USA/5939/B()F	EXP. DATE:	12/31/87
MODEL NO.:	MO-1	USA/9069/B()F	EXP. DATE:	11/30/86
MODEL NO.:	MODEL 120	USA/9901/B()F	EXP. DATE:	05/31/88
MODEL NO.:	MODEL 60	USA/6387/B()F	EXP. DATE:	07/31/85
MODEL NO.:	MRC-20WC	USA/9142/B()	EXP. DATE:	04/30/87
MODEL NO.:	NFS-IX-A	USA/5468/B()F	EXP. DATE:	01/31/87
MODEL NO.:	S5W REFUEL. SRCE	USA/5757/B()F	EXP. DATE:	03/31/88
MODEL NO.:	TREAT	USA/5828/B()F	EXP. DATE:	10/31/87
MODEL NO.:	0.5T	USA/6166/B()	EXP. DATE:	10/31/84
MODEL NO.:	2501	USA/5916/B()F	EXP. DATE:	04/30/87
MODEL NO.:	4T	USA/6478/B()	EXP. DATE:	10/31/84
MODEL NO.:	51032-1	USA/6581/AF	EXP. DATE:	05/31/89
MODEL NO.:	51032-1A	USA/6581/AF	EXP. DATE:	05/31/89

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LIST OF REGISTERED PACKAGES BY PACKAGE TYPE

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TYPE OF PACKAGING IS: WASTE, B

MODEL NO.:	AP-101	USA/9071/B()	EXP. DATE:	11/30/86
MODEL NO.:	B-2	USA/6144/B()	EXP. DATE:	01/31/85
MODEL NO.:	CNS 1-13C	USA/9081/B()	EXP. DATE:	12/31/87
MODEL NO.:	CNS 1-13C II	USA/9152/B()	EXP. DATE:	03/31/87
MODEL NO.:	CNS 14-190	USA/5026/B()	EXP. DATE:	01/31/85
MODEL NO.:	CNS 3-55	USA/5805/B()	EXP. DATE:	12/31/88
MODEL NO.:	CNS 8-120	USA/6601/B()	EXP. DATE:	12/31/85
MODEL NO.:	FSV-2	USA/6745/B()	EXP. DATE:	02/28/85
MODEL NO.:	HN-200	USA/6574/B()	EXP. DATE:	03/31/85
MODEL NO.:	NUS 10-135	USA/9073/B()	EXP. DATE:	03/31/88
MODEL NO.:	OH-142	USA/9075/B()	EXP. DATE:	03/31/88
MODEL NO.:	OH-142 MKI	USA/9073/B()	EXP. DATE:	03/31/88
MODEL NO.:	OH-142 MKIB	USA/9073/B()	EXP. DATE:	03/31/88
MODEL NO.:	OH-142 MKII	USA/9073/B()	EXP. DATE:	03/31/88
MODEL NO.:	SN-1	USA/6771/B()	EXP. DATE:	07/31/86
MODEL NO.:	6244	USA/6244/B()	EXP. DATE:	08/31/89
MODEL NO.:	6272	USA/6272/B()	EXP. DATE:	03/31/85
MODEL NO.:	6744	USA/6744/B()	EXP. DATE:	11/30/85
MODEL NO.:	PWR-2 CORE BAR.	USA/9791/B(U)	EXP. DATE:	04/31/89

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U.S. N. R. C.
INDEX OF CERTIFICATES
BY MODEL NO.
OCTOBER 25, 1984

MODEL NO.	*	CERTIFICATE NO.	MODEL NO.	*	CERTIFICATE NO.
A-0109	*	6280	CEN. UNIV. S	*	9135
AP-100	*	9074	CENTURY S	*	9135
AP-101	*	9071	CENTURY SA	*	9135
ATR	*	9099	CNS 1-13C	*	9081
B-2	*	6144	CNS 1-13C II	*	9152
B-3	*	6058	CNS 14-170 III	*	9151
BAPL 5910 BRDCG	*	9119	CNS 14-190	*	5026
BB-250-1	*	5517	CNS 14-195-H	*	9094
BB-250-2	*	5768	CNS 21-300	*	9096
BCL-2	*	9068	CNS 3-55	*	5805
BCL-3	*	9067	CNS 6-75	*	9108
BCL-4	*	5950	CNS 6-80-2	*	9111
BETTIS WASTE	*	6142	CNS 6-80-2A	*	9111
BMI-1	*	5957	CNS 7-100	*	9080
BNL UNIR CONT	*	9853	CNS 8-120	*	6601
BNL UNTRR FUEL	*	9191	D-38	*	5787
BS-33-180	*	6722	DA520	*	9013
BU-5	*	6458	DA521	*	9013
BU-6	*	9018	DOT-6M TYPE B	*	5908
BU-7	*	9019	DT-14	*	9852
C-1	*	9036	DT-2	*	6227
C-10	*	9133	DT-5	*	6227
C-8	*	9128	DT-7	*	6227
CE-250-2	*	9022	D2G POWER UNIT	*	6441
CEN. UNI. SA	*	9135	D34710-1	*	5088

MODEL NO.	* CERTIFICATE NO.	MODEL NO.	* CERTIFICATE NO.	MODEL NO.	* CERTIFICATE NO.
D34710-2	* 5088	GNG-20	* 9163	MODEL B	* 6206
E-MEH-00-00004	* 9011	GPHS	* 9510	MODEL 120	* 9901
ETR	* 9134	HN-100 SERIES 1	* 9086	MODEL 60	* 6387
F-147	* 9174	HN-100 SERIES 2	* 9079	MRC-20WC	* 9142
FD	* 5463	HN-100 SERIES 3	* 9151	MW-3000	* 9030
FL 10-1	* 9009	HN-100 2A	* 9079	MX-IC-100	* 9110
FPD-100	* 9057	HN-100S	* 9089	N-55	* 9070
FSV-1	* 6346	HN-200	* 6574	NAC-1	* 9183
FSV-2	* 6745	HN-600	* 9080	NATICK IRRADI	* 5362
FSV-3	* 6347	HUSMAN IRRAD.	* 9182	NBS UNIR CONT	* 9853
GAS CYL FIRE	* 5552	IF-300	* 9001	NFP-55	* 5341
GE-100	* 5926	IR-100	* 9157	NFS-IX-A	* 5468
GE-1000	* 9045	IR-50	* 9156	NFS-URANYL NIT.	* 5059
GE-1100	* 9046	KKP-20-4950	* 9100	NLI-1/2	* 9010
GE-1400	* 9051	L	* 5595	NLI-10/24	* 9023
GE-1500	* 5939	LL-60-150	* 6568	NLI-6502	* 9103
GE-1600	* 9044	LP-12	* 6677	NNFD-SA-2	* 5910
GE-200	* 5971	LP-12-1	* 9964	NNFD-10	* 6357
GE-21PF-1	* 4909	LP-50	* 6678	NONE SPECIFIED	* 6406
GE-400	* 5998	LWBR NEW FUEL	* 9784	NPI-20WC-6	* 9102
GE-500	* 9049	M	* 5595	NPI-67-0442	* 5364
GE-600	* 5980	M-130	* 6003	NRBK-41	* 5814
GE-700	* 5942	M-160	* 9781	NRBK-42	* 5814
GE-8500	* 6697	MHW-IHS-SC	* 9503	NRBK-43	* 5814
GE-900	* 9050	MO-1	* 9069	NRBK-44	* 5875

MODEL NO.	* CERTIFICATE NO.	MODEL NO.	* CERTIFICATE NO.	MODEL NO.	* CERTIFICATE NO.
NUPAC 7/100	* 9178	ORNL UNIRR FUEL	* 9191	SENTINEL-25A	* 4888
NUPAC 10/140	* 9177	PADUCAH TIGER	* 6553	SENTINEL-25B	* 4888
NUPAC 100	* 9080	PAS-1	* 9184	SENTINEL-25C	* 4888
NUPAC 14/190H	* 9159	PAS-2	* 9181	SENTINEL-25C3	* 4888
NUPAC 14/190L	* 9159	PAS-2A	* 9181	SENTINEL-25D	* 4888
NUPAC 14/190M	* 9159	PAT-1	* 0361	SENTINEL-25E	* 4888
NUPAC 14/210H	* 9176	PAT-2	* 9150	SENTINEL-25F	* 4888
NUPAC 14/210L	* 9176	PWR-2 CORE BAR.	* 9791	SENTINEL-3	* 9030
NUPAC 14D-2.0	* 9079	RA-2	* 4986	SENTINEL-8	* 9030
NUPAC 50-1.5L	* 9145	RA-3	* 4986	SGC-1	* 9144
NUPAC 50-2.5L	* 9145	RAD-WASTE CR.I	* 9105	SL-10-1	* 9020
NUPAC 50-3.0L	* 9145	RCC	* 5450	SN-1	* 6771
NUPAC 50-4.0L	* 9145	RCC-1	* 5450	SNAP 21	* 5830
NUPAC 6/100H	* 9179	RCC-2	* 5450	SNAP-23AND.1000	* 9017
NUPAC 6/100L	* 9179	RCC-3	* 5450	SPEC 2-T	* 9056
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OH-142 MKIB	* 9073	RMG-184	* 5687	S5W ITR	* 9783
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ORNL TRV CALIF	* 5740	SENTINEL 8S	* 9085	T-2	* 5607
ORNL UNIR CONT	* 9853	SENTINEL-100F	* 5862	T-3	* 9132

MODEL NO.	*	CERTIFICATE NO.	MODEL NO.	*	CERTIFICATE NO.	MODEL NO.	*	CERTIFICATE NO.
TN-8	*	9015	20	*	9126	500-SU	*	9006
TN-8L	*	9015	20-VS	*	9160	500SU-OP	*	9180
TN-9	*	9016	20A	*	9126	51032-1	*	6581
TREAT	*	5828	200	*	9127	51032-1A	*	6581
TRIGA-1	*	9034	200A	*	9127	520	*	9007
TRIGA-2	*	9037	235R001	*	6386	57.5 X 108 CORE	*	5914
UCC-20WC-2	*	9098	25.0 SPARE MOD.	*	6188	589	*	9139
UCC-20WC-2A	*	9098	2501	*	5916	5979	*	5979
UNC-1484	*	4949	3206B	*	9167	5984	*	5984
UNC-2500	*	5641	3218	*	9167	6-GS-1	*	6550
UNC-2600	*	5086	3227B	*	9167	6244	*	6244
UNC-2901	*	6294	4.5 TON CF	*	6642	6272	*	6272
URIPS-P-1	*	5071	4T	*	6478	6400	*	6400
URIPS-8A	*	6786	40-VS	*	9160	650	*	9032
URIPS-8B	*	6786	426A	*	6049	660	*	9033
W-21PF-1	*	4909	426B	*	6049	660B	*	5563
WAPD-39	*	5875	48 H	*	9090	660C	*	5563
WAPD-40	*	5874	48 HX	*	9090	660E	*	9033
0.5T	*	6166	48 OM	*	9090	6679	*	6679
100	*	9127	48A	*	6273	6717-B	*	6717
100A	*	9127	48F	*	6273	6744	*	6744
11.9 NEW FUEL	*	6134	48X	*	6273	676	*	9029
181361	*	5796	48Y	*	6273	676E	*	9029
181375	*	5796	50	*	9126	680	*	9035
2.7 NEW FUEL	*	5894	50A	*	9126	680E	*	9035

MODEL NO. * CERTIFICATE NO.

683	*	9053
684	*	9028
684E	*	9028
702	*	6613
715	*	9039
741	*	9027
741E	*	9027
750	*	9021
770	*	9148
771	*	9107
814A	*	5149
820	*	9137
850	*	9147
855	*	9165
858	*	9154
864	*	9166
865	*	9187
900	*	9141
910	*	9149
9189	*	9189
920	*	9143
927A1	*	6078
927C1	*	6078
961A	*	5172

NRC FORM 335 (7-77)		U.S. NUCLEAR REGULATORY COMMISSION BIBLIOGRAPHIC DATA SHEET		1. REPORT NUMBER (Assigned by DDC) NUREG-0383 Vol 2, Rev 7	
4. TITLE AND SUBTITLE (Add Volume No., if appropriate) Directory of Certificates of Compliance for Radioactive Materials Packages Certificates of Compliance				2. (Leave blank)	
7. AUTHOR(S)				3. RECIPIENT'S ACCESSION NO.	
9. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Division of Fuel Cycle and Material Safety Office of Nuclear Material Safety and Safeguards U.S. Nuclear Regulatory Commission Washington, DC 20555				5. DATE REPORT COMPLETED MONTH YEAR September 1984	
				DATE REPORT ISSUED MONTH YEAR November 1984	
12. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Same as 9, above				6. (Leave blank)	
				8. (Leave blank)	
				10. PROJECT/TASK/WORK UNIT NO.	
13. TYPE OF REPORT				11. CONTRACT NO.	
				PERIOD COVERED (Inclusive dates)	
15. SUPPLEMENTARY NOTES				14. (Leave blank)	
16. ABSTRACT (200 words or less) This directory contains a Summary Report of NRC Approved Packages (Volume 1), Certificates of Compliance (Volume 2), and a Summary Report of NRC Approved Quality Assurance Programs for Radioactive Material Packages (Volume 3). The purpose of this directory is to make available a convenient source of information on packagings which have been approved by the U.S. Nuclear Regulatory Commission. To assist in identifying packaging, an index by Model Number and corresponding Certificate of Compliance number is included at the back of each volume of the directory. The Summary Report includes a listing of all users of each package design prior to the publication date of the directory. Shipments of radioactive material utilizing these packagings must be in accordance with the provisions of 49 CFR 173.471 and 10 CFR Part 71, as applicable. In satisfying the requirements of Section 71.12, it is the responsibility of the licensees to insure that they have a copy of the current approval and conduct their transportation activities in accordance with an NRC approved quality assurance program. Copies of the current approval may be obtained from the U.S. Nuclear Regulatory Commission Public Document Room files (see Docket No. listed on each certificate) at 1717 H Street, Washington, DC 20555. Note that the general license of 10 CFR 71.12 does not authorize the receipt, possession, use or transfer of byproduct source, or special nuclear material; such authorization must be obtained pursuant to 10 CFR Parts 30 to 36, 40, 50, or 70.					
17b. IDENTIFIERS/OPEN-ENDED TERMS Transportation, Packaging, Radioactive Materials					
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