NUREG-0383
Volume 2
Revision 23

Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

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NUREG-0383
Volume 2
Revision 23

Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

Manuscript Completed: October 2000
Date Published: November 2000

Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

FOREWORD

The purpose of this directory is to make available a convenient source of information on packaging 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 front of Volumes 1 and 2. An alphabetical listing by user name is included in the back of Volume 3 for approved Quality Assurance programs. The reports include a listing of all users of each package design and approved Quality Assurance programs prior to the publication date of the directory.

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10/31/2000

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NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
0361	7	USA/0361/B(U)F-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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, as supplemented.

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 distributer are encased within the redwood.

The TB-1 containment vessel is approximately 8-1/2 inches outside length by 6-3/4 inches outside diameter. The minimum wall thickness of the vessel is approximately 1/2 inch. The interior cavity of the vessel is a right circular cylinder, 4-1/4 inches diameter, with hemispherical ends. The vessel is closed by 12, 1/2-inch diameter bolts and doubly sealed with a copper gasket and knife edges and an elastomer O-ring.

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 as supplemented by Issue B of Drawing Nos. 1004, 1009, 1013, 1016, 1017, 1018, 1019, 1020 and 1022.

(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) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

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.

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	Etiologic Agent

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, 2003.

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.
Supplements dated: July 27, 1990 and July 20, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: Sept. 15, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
4888	11	USA/4888/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of the Air Force
Technical Operations Division/CC
6000 Patrol Road
McClellan AFB, CA 95652-1709

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Teledyne Energy Systems applications dated April 26, 1985 and August 19, 1986, 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 No.: 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	25 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

5. (a) Packaging (Continued)

(3) Drawings

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

Model No.	Drawing Nos.
All Models	Isotopes, Inc. Drawing Nos.: 001-20000, Rev. E 001-20001, Rev. F 001-20002, Ref. F 001-20003, Sht. 1, Rev. B 001-80003
Sentinel-25A, LCG-25A	Martin Company Drawing Nos.: N0013100, Rev. A N0013108, Rev. D 001-40000, Rev. A Isotopes, Inc. Drawing Nos.: 001-10000, Rev. B 001-70024, Rev. C 001-70025, Sht. 1, Rev. D 001-70033, Shts. 1 & 2, Rev. A 001-70036 001-80005
Sentinel-25B, LCG-25B	Martin Company Drawing Nos.: N0013200, Rev. C 001-40012 Isotopes, Inc. Drawing Nos.: 001-70024, Rev. C 001-70025, Sht. 1, Rev. D 001-70033, Shts. 1 & 2, Rev. A 001-70036 001-80005
Sentinel-25C, LCG-25C	Martin Company Drawing Nos.: 001-40004, Rev. A 001-70010 001-70012, Rev. B 001-80004 Isotopes, Inc. Drawing Nos.: 001C10000, Sht. 1 Rev. D, & Sht. 3 001-70009, Rev. D
Sentinel-25C3	Isotopes, Inc. Drawing Nos.: 001C10000 Shts. 1 & 2, Rev. D 001-70009, Rev. D 001-70057, Rev. D 001-70060, Rev. C 001-40019, Rev. B

Sentinel-25D	Martin Company Drawing No. 001-80004 Isotopes, Inc. Drawing Nos.: 001D10000 Shts. 1 & 2, Rev. C 001-70036 001-70033 Shts. 1 & 2, Rev. A 001-70025 Sht. 1, Rev. D 001-70024, Rev. C 001-40015, Rev. C 001-40006, Rev. B
Sentinel-25E	Isotopes, Inc. Drawing Nos.: 001E10000, Shts. 1 & 2, Rev. E, & Sht. 3 001-70039, Rev. C 001-70025, Sht. 1, Rev. D & Sht. 2 001-70024, Rev. C 001-40017, Shts. 1 & 2, Rev. D 001-40006, Rev. B
Sentinel-25F	Isotopes, Inc. Drawing Nos.: 001F10000, Shts. 1 & 2, Rev. H* 001-70070, Rev. C 001-70060, Rev. C 001-70009, Rev. D 001-40025, Rev. A

*As modified by Figure 1 of the April 26, 1985, application.

(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 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

6. A barrier (permitting the free circulation of air) must be provided with sufficient separation distance to ensure that the requirement of §71.43(g) will be met.

7. Eye-bolts shall be removed or covered during transportation to prevent their use as tie-down devices of packages.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be operated, prepared for shipment and maintained in accordance with the following Operating Procedures and Maintenance Programs:

Model No.	Operating Procedures	Maintenance Program
Sentinel-25A, LCG-25A	Appendix E of TES-3206, as revised	Appendix F of TES-3206, as revised
Sentinel-25B, LCG-25B	Appendix E of TES-3209, as revised	Appendix F of TES-3209, as revised
Sentinel-25C, LCG-25C	Appendix E of TES-3210, as revised	Appendix F of TES-3210, as revised
Sentinel-25C3	Appendix E of TES-3211, as revised	Appendix F of TES-3211, as revised
Sentinel-25D	Appendix E of TES-3212, as revised	Appendix F of TES-3212, as revised
Sentinel-25E	Appendix E of TES-3213, as revised	Appendix F of TES-3213, as revised
Sentinel-25F	Chapter VIII of TES-3202, as revised	Chapter IX of TES-3202, as revised

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: January 31, 2002.

REFERENCES

Teledyne Energy Systems applications dated April 26, 1985; and August 19, 1986.

Teledyne supplements dated: November 3, 1986; September 17 and December 2, 1991.

Department of the Air Force supplement dated: November 12, 1993; and December 11, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 01/30/97

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
4986	38	USA/4986/AF	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Global Nuclear Fuel - Americas, L.L.C.
P.O. Box 780
Wilmington, NC 28402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated September 10, 1997, as supplemented.

c. DOCKET NUMBER 71-4986

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.: 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 approximately 11 inches by 18 inches by 178 inches long and is positioned within a wooden outer container approximately 30 inches by 30 inches by 207 inches long. Cushioning is provided between the inner and outer containers by phenolic impregnated honeycomb and ethafoam. Closure is accomplished by bolts. 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.

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

769E229, Revision 9
769E231, Revision 8

(4) Product Container

The fuel rod product container is constructed in accordance with General Electric Company Drawing No.:

0028B98, Revision 0

5.(b) Contents

(1) Type and form of material

(i) Unirradiated UO_2 fuel assemblies. Each fuel assembly is made up of either 60 or 62 rods in an 8 x 8 square array with maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 150 inches. The maximum U-235 enrichment is 5.0 percent by weight, and the maximum average enrichment is 5.0 percent by weight. The maximum pellet diameter, minimum clad thickness, water rod specifications, and poison rod specifications are in accordance with Section 6.1, Appendix 8-H, of the supplements dated June 27 and November 1, 1995.

(ii) Unirradiated UO_2 fuel assemblies. Each fuel assembly is made up of 74 full and partial length rods in a 9 x 9 square array with maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 150 inches. The maximum U-235 enrichment is 5.0 percent by weight, and the maximum average enrichment is 4.6 percent by weight. The maximum pellet diameter, minimum clad thickness, water rod specifications, and poison rod specifications are in accordance with Section 6.1, Appendix 8-I, of the supplements dated June 27 and November 1, 1995.

(iii) Unirradiated UO_2 fuel assemblies. Each fuel assembly is made up of 92 full and partial length rods in a 10 x 10 square array with maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 150 inches. The maximum U-235 enrichment is 5.5 percent by weight, and the maximum average enrichment is 5.0 percent by weight. The maximum pellet diameter, minimum clad thickness, water rod specifications, and poison rod specifications are in accordance with Section 6.1, Appendix 8-J, of the supplements dated June 27 and November 1, 1995.

(iv) Unirradiated UO_2 fuel rods, which are contained within the product container specified in 5(a)(4). The maximum U-235 enrichment is 5.0 by weight. The fuel rods are clad with zircaloy, incaloy, inconel, or stainless steel. The minimum pellet diameter is 0.340 inch, and the maximum pellet diameter is 0.515 inch.

(v) Unirradiated UO_2 fuel rods, which may be loose or may be strapped together. The maximum U-235 enrichment is 5.0 by weight. The fuel rods are clad with zircaloy, incaloy, inconel, or stainless steel. The minimum pellet diameter is 0.340 inch, and the maximum pellet diameter is 0.515 inch.

5.(b) Contents (Continued)

(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 (2) fuel assemblies. Total quantity of radioactive material within a package may not exceed a Type A quantity.

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

Two (2) fuel bundles. A fuel bundle is defined as any number of fuel rods contained within the product container specified in 5(a)(4).

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

Two (2) fuel bundles. A fuel bundle is defined as a maximum of 14 fuel rods positioned within one side (channel) of the inner container.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For the contents described in 5(b)(1)(i), 5(b)(1)(ii) and 5(b)(1)(iii), and limited in 5(b)(2)(i):	0.4
For the contents described in 5(b)(1)(iv), and limited in 5(b)(2)(ii):	6.3
For the contents described in 5(b)(1)(v), and limited in 5(b)(2)(iii):	2.9

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.

7. Polyethylene holders with a maximum effective thickness of 0.151 inches (0.3835 cm) may be placed surrounding the fuel assembly up to a maximum of 0.13 grams H_2O hydrogen equivalent per cubic centimeter averaged over the assembly. The effective holder thickness is the linear average of the maximum and minimum thickness.

8. Polyethylene shipping shims may be inserted between rods within the fuel assemblies up to a maximum of 0.10 grams H_2O hydrogen equivalent per cubic centimeter averaged over the assembly. The shipping shims may be used with or without the polyethylene holders.

9. For shipment of fuel rods described in 5(b)(1)(iv) and 5(b)(1)(v), each fuel rod may be contained within a polyethylene sheath with a maximum thickness of 0.01 inch. Dunnage is permitted within the product container, and within the inner container, provided that the dunnage does not have a hydrogen density greater than that of water.

10. Maximum average enrichment means the highest enrichment averaged over any axial zone of the assembly.

11. In addition to the requirements of Subpart G of 10 CFR Part 71, each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 6 of the application, and the package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 6 of the application.

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, 2003.

REFERENCES

General Electric Company application dated September 10, 1997.

Supplements dated: November 20, 1997; June 5 and 25, July 1 and 21, and August 14, 1998; and October 14, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: May 10, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5059	12	USA/5059/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Nuclear Fuel Services, Inc.
P. O. Box 337, MS 123
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

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

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 Specification 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 5% by weight. The U-235 content of the solution must not exceed 10 grams per liter.

The total uranium content must not exceed 357 grams per liter (1.5M). The $UO_2(NO_3)_2$-$6H_2O$ 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.

5. (b) Contents (continued)

(2) Maximum quantity of material per package

Not more than 45,600 pounds net weight of uranyl nitrate acid solution. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

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

(a) Each package must be acceptance tested and maintained in accordance with Section 8.0 of the application, as supplemented.

(b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures in Section 7.0 of the application, as supplemented.

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: August 31, 1996.

REFERENCES

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

Supplements dated: August 6, 1986, and July 18, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William Travers

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 4/26/96

NRC FORM 618
(3-96)
10 CFR 71

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
5086	11	USA/5086/B(U)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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505-0785

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock and Wilcox Company application dated November 29, 1993.

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-gauge steel box with inside dimensions of 2-5/8" high x 7" wide x 96" long. The inner container is supported in a 22-1/2" ID by 102-1/2" long, 14-gauge 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 irons. The outer container closure is made with a 14-gauge drum lid with 12-gauge 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 Thomas Gutman Consultant Drawing No. B-2600-2, Sheets 1 through 6, Rev. 3.

(b) Contents

(1) Type and form of material

Unirradiated, uranium-zirconium, Naval fuel elements. The uranium may be enriched to any degree in the U-235 isotope.

(2) Maximum quantity of material per package

Up to 8.9 kilograms of U-235 per package. The ratio of the weight of U-235 to the weight of U-235 plus zirconium shall not exceed 0.074. The net weight of the contents shall not exceed 265 pounds.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 1.4

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

(a) The package must be prepared for shipment and operated in accordance with Chapter 7 of the application.

(b) The package must be acceptance tested and maintained in accordance with Chapter 8 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: January 31, 2004.

REFERENCES

Babcock and Wilcox application dated November 29, 1993.

Supplements Dated: September 19, 1994; January 5, 1995; and December 21, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: January 29, 1999

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5149	10	USA/5149/B( )F	1	2

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Babcock & Wilcox Company application dated September 20, 1979, as supplemented.

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) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 25.0

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

7. Use of packaging fabricated after August 31, 1986, is not authorized.

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

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in the application supplement dated May 18, 1990.

   (b) The package shall be maintained in accordance with the Maintenance Program in the application supplement dated May 18, 1990.

9. Expiration date: June 30, 2005.

REFERENCE

Babcock & Wilcox application dated September 20, 1979.

Babcock & Wilcox supplements dated: May 18, 1990, and April 27, 1995.

BWX Technologies Inc., supplement dated: June 1, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 28, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5580	7	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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, as amended.

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 234 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.

(3) Drawings

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

5. (b) Contents

(1) Type and form of material

Unirradiated fuel in the form of S3G Core 3 power units with control rods installed and secured in place by holddown mechanisms.

(2) Maximum quantity of material per package

One fuel assembly.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Expiration Date: December 31, 2002.

REFERENCE

Safety Analysis Report for S5W Power Unit Shipping Container, WAPD-OP(R)SA-820 dated August 9, 1968; Addendum to WAPD-OP(R)SA-820 dated September 28, 1987.

Naval Reactors Supplements dated: March 2, 1992 (G#92-03388) and June 11, 1997 (G#97-03513).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 11, 1997

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5607	11	USA/5607/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

T-2 Shipping Package, Safety Analysis Report, Draft: April 1980, as supplemented.

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 8.0 inches thick along a 45-inch center section reduced to 4.2 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.

(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, Rev. 2*; and 147216, Rev. 1.

* As provided in the April 12, 1983, supplement

5.(a) (3) Drawings (Continued)

(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; W0147-0231-DD, Rev. 3; W0147-0234-DC, Rev. 4; and W0147-0312-DE, Rev. 2.

(b) Contents

(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. 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. 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. 4.

(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)(l)(ii), fissile material (U-235) not to exceed 300 grams.

(c) Transport Index for Criticality Control

For the contents described in 5(b)(l)(i) and 5(b)(l)(ii), and limited in 5(b)(2)(i) and 5(b)(2)(ii):

Minimum transport index to be shown on label for nuclear criticality control: 0.4

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 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.

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

9. In addition to the requirements of Subpart G of 10 CFR Part 71 and the other conditions of this certificate:

   (a) The package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 of the application, as supplemented; and

   (b) The package must be maintained in accordance with the Maintenance Program of Chapter 8 of the application, as supplemented.

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, 2003.

REFERENCES

DuPont Safety Analysis Report, Draft April 1980.

Department of Energy supplements dated: February 11, April 8 and 20, 1982; April 12, 1983; February 26, 1992; February 3, 1993; and April 22 and June 4, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: July 24, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5740	5	USA/5740/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

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, as supplemented.

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 inner 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.

5. (a)(3) Drawing

The package and special trailer are constructed in accordance with Oak Ridge National Laboratory (ORNL) Drawing Nos.:
M-11230-EN-001-D Rev. 4
M-11230-EN-002-D Rev. 0
M-11230-EN-003-D Rev. 0
M-11230-EN-004-D Rev. 2
M-11230-EN-005-D Rev. 0
M-11230-EN-006-D Rev. 0
M-11230-EN-007-D Rev. 0
M-11230-EN-008-D Rev. 1
M-11230-EN-012-E Rev. 4
M-11230-EN-014-E Rev. 3
M-11230-EN-017-D Rev. 3
M-11230-EN-018-E Rev. 0
(Appendix A, August 7, 1981 revision of ORNL-5409/R1, as supplemented.)

(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. The contents described in 5(b)(1) must be shipped in a seal welded special form inner container as described in section 5.2.1 of the application.

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

(i) Each packaging must be maintained in accordance with the supplement dated May 10, 1991; and

(ii) The package must be prepared for shipment and operated in accordance with the supplement dated May 10, 1991.

8. A minimum of two lifting ribs shall be used to lift the package.

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

10. Expiration date: July 31, 2001.

REFERENCES

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.

Supplements dated: April 4, 1986; March 26, April 23, and May 10, 1991; June 4, 1992; and May 13, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William Travers

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 7/15/96

NRC FORM 618
(3-96)
10 CFR 71

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
5757	7	USA/5757/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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
Refueling Source shipping container
dated February 14, 1968, as supplemented

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 ½-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 forging. 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 to attenuate the gamma radiation. A wall of polyethylene, 8-1/2 inches thick, surrounds the lead shield and is canned with a ½-inch thick carbon steel plate. Gross weight is approximately 19,000 pounds.

(3) Drawings

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

5.(b) Contents

(1) Type and form of material

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

(ii) Plutonium 238-Beryllium special form radioactive material neutron source. These sources may be either new or irradiated and 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 940 curies, with radium limited to not more than 2.5 curies (gms) and total emission rate of 3.8×10^7 n/sec. These sources are limited to 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 925 curies and total emission rate of 1.48×10^9 n/sec. These sources are limited to a combined surface contamination of not more than an A_2 quantity of radioactive material.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 11.2

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, 2003.

REFERENCES

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

Supplements: Bettis Atomic Power Laboratory letter WAPD-OP(R)C-474 dated December 22, 1975. Naval Reactors letter G#92-03738, dated October 15, 1992; and G#C97-03621 dated October 17, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 31 MAR 98

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5796	14	USA/5796/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Advanced Medical Systems Inc.
121 North Eagle Street
Geneva, OH 44041

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Advanced Medical Systems, Inc. application dated June 3, 1997, as supplemented.

c. DOCKET NUMBER 71-5796

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 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) Drawing

(I) The Model No. 181375 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos.: E590G; D16423A; D16423B; D16424D; D16479; D16568; C16580E; B46411; A46686A; E63790F; D181368G; D181369E (2 pages); D181375N; D184705; D184713; D200016G; D200043; D200073F; D200074C; D200075C; D200079C; C200742-1 THRU 5; B200743-1,5; and B200745-1 THRU 4.

(ii) The Model No. 181361 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos.: D-T60-478-B; C50104-B; D55100-A; C55103-B; C55105-B; D13706A-D (2 pages); D-181356-F; D-181357-F; D-181361-E, B181390-B; and D-200017-A.

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.

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

(a) The packages must be operated and prepared for shipment in accordance with the Operating Procedures of Chapter 7 of the application.

(b) Each packaging must meet the Acceptance Tests and Maintenance program of Chapter 8 of the application.

7. Use of packaging fabricated after August 31, 1986, is not authorized.

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, 2002.

REFERENCES

Advanced Medical Systems, Inc. application dated June 3, 1997.

Supplements dated: July 17, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Hanger Osgood for

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: 07/31/97

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5797	14	USA/5797/B(U)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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO (Name and Address)
U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
U.S. Department of Energy
application dated May 30, 1991,
as supplemented.

c. DOCKET NUMBER
71-5797

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.: 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 containers are right circular cylinders with an 11-gauge carbon steel shell. The lid is attached to the container with sixteen 3/8-16x1-inch steel bolts. The steel shell is filled with stacked fir plywood rings. The plywood rings form a central cavity which is lined with 1-inch thick polyethylene foam.

The packaging for the inner HFIR fuel element has overall dimensions of 25 inches OD by 45 inches 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 inches OD x 45.75 inches high, a 17-3/8-inch diameter by 31-1/8-inch deep cavity, and a 1,050 pound gross weight.

(3) Drawings

(i) The packaging for the inner HFIR fuel is constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-20978-EL-003E, Rev. E, and M-20978-EL-008E, Rev. C.

(ii) The packaging for the outer HFIR fuel is constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-20978-EL-002E, Rev. D, and M-20978-EL-008E, Rev. C.

5. (b) Contents

(1) Type and form of material

Uranium as U_3O_8-Al cermet, enriched up to 95% 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 ORNL/TM-9220, "Specifications for High Flux Isotope Reactor Fuel Elements HFIR-FE-3," and in the following Oak Ridge National Laboratory Drawing Nos: E-42118, Rev. Q; E-42112, Rev. H; D-42113, Rev. G; E-42114, Rev. H; and E-42117, Rev. H.

(ii) For the packaging described in 5(a)(3)(ii) the contents are described in ORNL/TM-9220, "Specifications for High Flux Isotope Reactor Fuel Elements HFIR-FE-3," and in the following Oak Ridge National Laboratory Drawing Nos: E-42126, Rev. M E-42120, Rev. H; D-42121, Rev. H; D-42122, Rev. H; and E-42125, Rev. J.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i) not more than 2.63 kg of U-235.

(ii) For the contents described in 5(b)(1)(ii) not more than 6.88 kg of U-235.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The lid lifting attachments must be blocked as shown on Martin Marietta Energy Systems, Inc., Drawing No. M-20978-EL-009E, Rev. 2, to prevent inadvertent use of the attachments during transport.

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

(a) Each package shall be maintained in accordance with the Maintenance Program in Chapter 8 of the application;

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

(c) The fuel element shall meet the fabrication inspection requirements of ORNL/TM-9220, "Specifications for High Flux Isotope Reactor Fuel Elements HFIR-FE-3."

8. Use of packaging fabricated after December 31, 1976, is not authorized.

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, 2002.

REFERENCES

U.S. Department of Energy Application dated May 30, 1991.

Supplement dated: February 26, 1992, April 2, 1993, and September 23, 1996, September 2, 1998 and February 24, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: May 12, 2000

NRC FORM 618
(3-96)
10 CFR 71

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
5805	17	USA/5805/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc. application dated February 25, 1994.

c. DOCKET NUMBER

71-5805

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.

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.

5.(a) Packaging (continued)

(2) Description (continued)

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 2 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. An optional 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. 12; C-111-D-0001, Rev. 0; and C-111-E-0002, Rev. 1; and ATCOR Drawing Nos.: MOD 139-1, Rev. K; MOD 140, Rev. C; MOD 124, Rev. D; 0999-D-07, Rev. G; and 0999-C-08, Rev. G. An optional sunshade is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing No. C-110-D-5001, Rev. 1.

(b) Contents

(1) Type and form of material

Depleted Antimony-Beryllium (Sb-Be) neutron sources and irradiated metal components packaged in secondary containers.

(2) Maximum quantity of material per package

Package internal decay heat load not to exceed 250 watts. The source strength of depleted neutron sources not to exceed 2.3 curies of Antimony-124.

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-cm^3/sec (STP). In addition, the packaging containment cavity shall be leak tested at least once every twelve (12) months. The sensitivity of the test shall be at least 1×10^{-3} atm-cm^3/sec (STP).

9. The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application.

10. Each packaging must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

11. 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.

12. Expiration date: March 31, 2004.

REFERENCES

Chem-Nuclear Systems, Inc. application dated February 25, 1994.

Supplement dated: February 16, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date March 11, 1999

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5830	8	USA/5830/B( )	1	2

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Department of the Navy
Naval Sea Systems Command
Detachment
Radiological Affairs Support Office
PO Drawer 0260
NWS Yorktown, VA 23691-0260

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Minnesota Mining and Manufacturing Co.
Application dated June 28, 1968, as supplemented

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 [illegible] circular metal protective enclosure 52 inches in diameter by 68 inches high. Main components of the generator consist of an outer beryllium [illegible] housing; [illegible] shielding; thermal insulation; thermoelectric modules; and heat source. Total weight of the package is 1900 pounds.

(3) Drawings

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

(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 curies.

PRINTED ON RECYCLED PAPER

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

(a) The package must be prepared for shipment, operated and maintained in accordance with Minnesota Mining and Manufacturing Company Report No. MMM 3691-42, "SNAP-21 Program, Phase II, Deep Sea Radioisotope-Fueled Thermoelectric Generator Power Supply System, Shipping and Handling Manual."

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, 2005

REFERENCE

Minnesota Mining and Manufacturing Company application dated June 28, 1968. Department of Navy supplements dated June 8 and October 10, 1990, and September 20, 1995, April 16, 1998, and April 27, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 28, 2000

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5862	8	71-5862	USA/5862/B( )	1	OF	2

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Department of the Air Force
HQ ATAC/SEG
1030 S. Highway A1A
Patrick AFB, FL 32925-3002

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Teledyne Energy Systems application dated June 26, 1985, as supplemented.

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

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 meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

370,000 curies.

6. Fabrication of additional packagings is not authorized.

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

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in the supplement dated August 30, 1985.

(b) The package must be maintained in accordance with the Maintenance Program in the supplement dated August 30, 1985.

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, 2005.

REFERENCES

Teledyne Energy Systems application dated June 26, 1985.

Teledyne supplements dated: August 30, 1985; and July 26, 1990.

Department of the Air Force supplements dated: November 12, 1993; August 15, 1995; and August 25, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: October 6, 2000

NRC FORM 618
(3-96)
10 CFR 71

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
5926	17	USA/5926/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application
dated November 19, 1987, 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 double-walled steel circular cylinder, 20-1/4-inch diameter by 26-7/8 inch high with a central cavity approximately 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 General Electric Company Drawing Nos. 129D4727, Rev. 5; 129D4729, Rev. 5; 129D4730, Rev. 4; and 129D4731, Rev. 1.

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) Transport Index for Criticality Control

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

Minimum transport index to be shown on label for nuclear criticality control: 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be maintained in accordance with the maintenance procedures submitted with GE application dated January 18, 1993.

(b) The package must be prepared for shipment and operated in accordance with the operating procedures submitted with GE application dated January 18, 1993.

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, 2003.

REFERENCES

General Electric Company application dated January 18, 1993.

Supplements dated: March 3, 1993 and November 19, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 15, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5939	28	USA/5939/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application
dated November 19, 1992, 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.: 1500

(2) Description

A steel encased lead shielded shipping cask. The cask is double-walled steel circular cylinder, approximately 30 1/4-inch diameter by 48 1/2 inches high with a central cavity approximately 7-inch diameter by 25 inches high. The diameter is reduced from 30 1/4 inches to 17 1/2 inches by cone construction at the top 7 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 approximately 60 7/8 inches high by 50 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 15,500 pounds.

(3) Drawings

(i) The packaging is constructed in accordance with General Electric Company Drawing Nos. 129D4748, Rev. 7; 129D4749, Rev. 5; and 129D4750, Rev. 9.

(ii) An optional canister insert is constructed in accordance with the following Chem-Nuclear Systems, Incorporated Drawing Nos.:

C-110-D-48019-001, Rev. D; and C-110-A-48019-002, Rev. C.

5.(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 as $^{90}SrF_2$ or $^{137}CsCl$ capsules meeting Condition No. 6, below, or

(iii) Solid nonfissile irradiated metal hardware and reactor control rods (blades), or

(iv) Stainless steel encapsulated solid metal Co-60 sources, or

(v) Byproduct material as $^{137}CsCl$ capsules meeting Condition No. 7, below.

(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:

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

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

458,000 curies.

(iii) Item 5(b)(1)(iv) above:

200,000 curies.

(iv) Item 5(b)(1)(v) above:

157,000 curies.

(c) Maximum Transport Index for Criticality Control

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

Minimum transport index to be shown on
label for nuclear criticality control: 5.7

6. For the contents described in 5(b)(1)(ii): The $^{90}SrF_2$ capsules must be in accordance with Vitro Drawing Nos. H-2-66759, Rev. 0; and H-2-66758, Rev. O. The $^{137}CsCl$ capsules must be in accordance with Vitro Drawing Nos. H-2-66760, Rev. 0; and H-2-66761, Rev. O. After fabrication, the $^{90}SrF_2$ and $^{137}CsCl$ capsules must be leak tested using a method having sufficient sensitivity to detect a leak rate of 10^{-8} atm cc/sec. Any capsule with a detectable leak may not be delivered to a carrier for transport.

7. For the contents described in 5(b)(1)(v): The $^{137}CsCl$ capsules must be contained in the canister insert described in item 5(a)(3)(ii), above. The $^{137}CsCl$ capsules must be constructed and tested in accordance with Section 1.2.3 of the Chem-Nuclear Systems, Incorporated supplement dated March 1, 1993. The canister insert must be operated, tested, and maintained in accordance with Chapters 7 and 8 of the Chem-Nuclear Systems, Incorporated supplement dated March 1, 1993. The shipment period must be completed within 30 days following the placement of the canister lid on the canister insert.

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

   (a) The package shall be prepared for shipment, operated, and maintained in accordance with the "Shipping Package Assembly/Disassembly" sections of the application, as supplemented.

   (b) The silicone rubber lid gaskets must be replaced within the 12-month period preceding each shipment. Prior to each shipment the silicone rubber lid gaskets must be inspected. The silicone rubber gaskets must be replaced if inspection shows any defects. Cavity drain line must be sealed with appropriate sealant applied to threads of pipe plug.

   (c) The packaging shall be bubble tested within the 12-month period preceding each shipment, and after each third use. The bubble test shall be performed by filling the cask cavity to approximately 1/4-inch depth with water, reducing the cavity pressure to no more than 2.5 psia and holding for at least 5 minutes. Acceptance is indicated by no continuous generation of bubbles.

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

10. Expiration date: October 31, 2003.

REFERENCES

General Electric Company application dated November 19, 1992.

General Electric Company supplements dated December 12, 1997 and August 13, 1998.

Chem-Nuclear Systems, Incorporated supplement dated March 1, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Dated: October 8, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5957	26	USA/5957/B( )F	1	8

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, D.C. 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Department of Energy application dated April 18, 1995, as supplemented.

c. DOCKET NUMBER 71-5957

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.

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 with alternate spacer shown in CI Drawing No. 334D2193) 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. 00-000-236, 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. A.

(viii) Basket Assembly as shown in University of Missouri Research Reactor (MURR) Drawing No. 2234, Sheets 1 through 5, Revision 0.

(ix) HFBR assembly basket and spacer plate as shown in Brookhaven National Laboratory Drawing Nos.: BNL 93-001, Sheets 1, 2, and 3, Rev. 2, and BNL 93-002, Sheet 1, Rev. 2.

(x) Basket assembly as shown in General Electric Company Drawing No. 183C8253, Rev. 1.

(a) 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 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

5. (b) Contents (Continued)

(1) Type and form of material (Continued)

(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.

(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 6-27).

(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 is thermally stable up to 800°F.

(xi) Irradiated uranium enriched in the U-235 isotope meeting the requirements of special form radioactive material.

(xii) Intact irradiated MURR fuel assemblies containing not more than 775 grams of U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be 24 inches.

5. (b) Contents (Continued)

(1) Type and form of material (Continued)

(xiii) Intact irradiated MITR-II fuel assemblies containing not more than a nominal 510 grams of U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 24 inches.

(xiv) Intact irradiated High Flux Beam Reactor (HFBR) fuel assemblies containing not more than a nominal 351 grams of U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum of 93.5 w/o in the U-235 isotope. Active fuel length shall be nominal 24 inches.

(xv) Intact irradiated MTR-type fuel assemblies containing not more than 240 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

(xvi) Irradiated MTR-type fuel sections containing not more than 176 grams U-235 per fuel section prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length per fuel section shall be approximately 11 inches. The fuel assembly shall be sectioned only in the non-fuel bearing regions of the assembly.

(xvii) Intact irradiated MTR-type fuel assemblies containing not more than 282.7 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 20 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

(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).

(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).

5. (b) Contents (Continued)

(2) Maximum quantity of material per package (Continued)

(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 = no. assy's $\leq$ 70 w/o U-235, y = no. assy's > 70 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.

(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.

5. (b) Contents (Continued)

(2) Maximum quantity of material per package (Continued)

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

Eight (8) fuel assemblies as contained in the product container specified in 5(a)(4)(viii). The maximum burnup is 150 MWD/Assembly and the minimum cooling time of each fuel assembly is 150 days. The maximum radiation source term is 400,000 curies.

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

Eight (8) fuel assemblies, contained in the product container specified in 5(a)(4)(viii). The maximum decay heat per package is 200 watts.

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

Twenty (20) fuel assemblies contained in two baskets separated by a spacer plate as specified in 5(a)(4)(ix). Each shipment must contain twenty fuel assemblies. The maximum burnup is approximately 130 MWD/assembly, and the minimum cooling time is 470 days.

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

Twelve (12) fuel assemblies contained in product container specified in 5(a)(4)(v).

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

Forty (40) fuel sections contained in the product container specified in 5(a)(4)(x). When a shipment contains less than the maximum number of fuel sections (40), empty fuel section basket spaces must be provided with an aluminum or steel spacer in the form of an open-ended pipe with a minimum outer diameter of 2.5 inches and a minimum wall thickness of 0.125 inches. The spacer must be of sufficient length to replace the absent fuel sections.

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

Eight (8) fuel assemblies contained in the peripheral locations of the basket specified in 5(a)(4)(v). The maximum burnup is 14%, the maximum decay heat is 15 watts per fuel assembly, and the minimum cool time is 120 days. Four aluminum inserts, as shown in Lockheed Martin Drawing No. 507584, Rev. 1, must be positioned in each of the four center basket locations.

5. (c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1) For the contents described in 5(b)(1)(iii) and 5(b)(1)(xv), and limited in 5(b)(2)(iii) and 5(b)(2)(xv): 0.4

(2) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(x), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), 5(b)(1)(xvi), and 5(b)(1)(xvii), 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)(x), 5(b)(2)(xi), 5(b)(2)(xii), 5(b)(2)(xiii), 5(b)(2)(xiv), 5(b)(2)(xvi), and 5(b)(2)(xvii): 100

6. For Item 5(b)(1)(iii), mixtures of fissile material are authorized, provided the following equation is satisfied:

$$\frac{X}{480} + \frac{Y}{480} + \frac{Z}{800} \leq 1, \text{ where}$$

X = Grams U-233 to be shipped
Y = Grams Pu-239 to be shipped
Z = Grams U-235 to be shipped

7. Except for the contents described in 5(b)(1)(ii), 5(b)(1)(iv) and 5(b)(1)(xii); and limited in 5(b)(2)(ii), 5(b)(2)(iv) and 5(b)(2)(xii), the cask must be shipped dry.

8. If the cask contents of 5(b)(1)(ii), 5(b)(1)(iv) or 5(b)(1)(xii) 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. When the contents of 5(b)(1)(vi) are loaded wet, the optional 0.5-inch diameter drain hole must be present in the primary basket lower plate to assure proper draining of the basket.

11. 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.

12. 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.

13. Axial movement of fuel assemblies must be limited so that the active fuel region will remain correctly positioned with respect to the poisoned section of the basket. Removable spacers may be used in each section of the basket to limit axial movement of the assemblies.

14. Contents must be securely confined in the cask cavity to minimize movement.

15. 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.

16. Gaskets and seals (cask and fuel canister) must be replaced at least every 12 months or earlier if visible degradation occurs.

17. For contents described in 5(b)(1)(iii) and limited in 5(b)(2)(iii), the mass of fissile material contained in reactor fuel must be based on the mass prior to irradiation.

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

    (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application. Additionally, for the contents described in 5(b)(1)(xvii), the package must be prepared for shipment in accordance with the procedures specified in the supplement dated January 29, 1999.

    (b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

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

20. Expiration date: March 31, 2001.

REFERENCES

Department of Energy application dated: April 18, 1995

Department of Energy supplement dated: November 20, 1995, September 4, 1998, January 29, 1999, and April 20, 1999

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Spent Fuel Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 12, 1999

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5979	10	USA/5979/B( )	1	2

PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Alpha-Omega Services, Inc.
9156 Rose Street
Bellflower, CA 90706

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Alpha-Omega Services, Inc. application dated June 1980, as supplemented.

c. DOCKET NUMBER 71-5979

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. 1; and 0093, Rev. 0.

(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.

PRINTED ON RECYCLED PAPER

5.(b) Contents (continued)

(2) Maximum quantity of material per package

13,000 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

a) Each package must meet the Maintenance Inspection Program of the supplement dated August 20, 1990; and

b) The package must be prepared for shipment in accordance with the Operating Procedures of the supplement dated August 20, 1990.

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: September 30, 2005.

REFERENCES

Alpha-Omega Services, Inc. application dated June 1980.

Supplement dated: April 12, 1983, May 22 and August 20, 1990, and January 30, November 16, 1995, and July 5, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 08/23/00

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5984	6	USA/5984/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

J. L. Shepherd and Associates
1010 Arroyo Avenue
San Fernando, CA 91340-8095

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 container. 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 and Associates Drawing Nos. A-0068-2C-1 dated March 8, 1969; and A-0068-2C dated April 26, 1995.

The inner shielded containers are constructed in accordance with J. L. Shepherd and Associates Drawing Nos. A-0068-1B, Rev. 2, or A-0068-1B-B, dated April 26, 1995, or A-0068-1B-A, dated April 26, 1995 . The special form source capsule is constructed in accordance with J. L. Shepherd and Associates Drawing No. A-0068-10 dated January 30, 1969.

(b) Contents

(1) Type and form of material

Cesium 137 as cesium chloride sources doubly encapsulated in stainless steel tubes which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

12,000 curies.

6. Use of packaging fabricated after August 31, 1986, is not authorized.

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

   a. The package shall be prepared for shipment and operated in accordance with "Inspection Operation, Handling and Maintenance Procedures" in the J. L. Shepherd and Associates submittal dated May 1, 1995.

   b. The package must meet the "Acceptance Tests" and "Checkout and Maintenance Procedures" in the J. L. Shepherd and Associates submittal dated February 20, 1990.

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, 2001.

REFERENCES

J. L. Shepherd and Associates' application dated September 12, 1974.

Supplements dated: January 20, 1975; February 20, 1990; February 6, and May 1, 1995; and April 11, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 4/23/96

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6003	19	USA/6003/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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.

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 Model No. 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 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.

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.

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.

5. (a) Continued

(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.

(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) Deleted.

(ii) Deleted.

(iii) Deleted.

(iv) D1G fuel modules of core types 1 or 2.

(v) D1G removable fuel assemblies of core types 1 or 2.

(vi) Deleted.

(vii) Deleted.

(viii) S3G-3/3A fuel module with or without control rods. The core age must be at least 4000 logging-corrected full-power hours.

(ix) Deleted.

(x) S3G-3/3A irradiated thermocouples and thermocouple cases.

(xi) S8G full size fuel cell with or without control rod.

(xii) S8G partial size fuel cell with or without control rod.

(xiii) Deleted.

(xiv) Deleted.

(xv) D2W fuel cells with control rods.

(xvi) NR-1 fuel modules with or without control rods.

(xvii) Deleted.

(xviii) A1W-3 recoverable irradiated fuel modules. Fuel modules that use control rods shall have control rods inserted.

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

(i) Deleted.

(ii) Deleted.

(iii) 6 fuel assemblies as described in 5(b)(1)(iv) and 4 fuel assemblies as described in 5(b)(1)(v).

(iv) Deleted.

(v) 10 fuel assemblies as described in 5(b)(1)(viii).

(vi) 9 fuel assemblies as described in 5(b)(1)(viii).

(vii) 9 fuel assemblies as described in 5(b)(1)(viii) and 1 structure as described in 5(b)(1)(x).

(viii) 4 fuel cells as described in 5(b)(1)(xi) or 2 fuel cells as described in 5(b)(1)(xi) and 2 fuel cells as described in 5(b)(1)(xii).

(ix) Deleted.

(x) Deleted.

(xi) 4 fuel cells as described in 5(b)(1)(xv) plus 2 corner fuel cells or 1 RFA fuel cell.

(xii) 4 fuel modules as described in 5(b)(1)(xvi).

(xiii) Deleted.

(xiv) For contents described in 5(b)(1)(xviii), 6 fuel modules or 8 fuel modules, as described in supplement dated March 30, 1992.

(3) Shipments shall be further limited by thermal requirements as follows:

(i) Shipment of contents specified in 5(b)(1)(iv) and 5(b)(1)(v) and limited in 5(b)(2)(iii) shall be made no earlier than 75 days after shutdown and shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.

(ii) Deleted.

(iii) Shipment of contents specified in 5(b)(1)(viii), 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.

(iv) Deleted.

5.(b)(3) Continued

(v) Shipment of contents specified in 5(b)(1)(xi) or 5(b)(1)(xii), as limited by 5(b)(2)(vii), shall have a fully loaded container heat load not to exceed 15,400 Btu/hr per shipment.

(vi) Deleted.

(vii) Deleted.

(viii) Shipment of contents specified in 5(b)(1)(xv) and limited in 5(b)(2)(xi) shall have a heat load not to exceed 19,100 Btu/hr and shall be made no earlier than 420 days after shutdown.

(ix) Shipment of contents specified in 5(b)(1)(xvi) and limited in 5(b)(2)(xii) shall have a heat load not to exceed 6,000 Btu/hr and shall be made no earlier than 50 days after shutdown.

(x) Deleted.

(xi) Shipment of contents specified in 5(b)(1)(xviii) and limited in 5(b)(2)(xiv) shall have a heat load not to exceed 43,800 BTU/hr and shall be made no earlier than 400 days or 175 days for A1W-3E and A1W-3J fuel, after shutdown.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

Except for the contents described in 5(b)(1)(iv) (Core 2), 5(b)(1)(v) (Core 2) and 5(b)(1)(viii) and limited in 5(b)(2)(iii) and 5(b)(2)(v)	100
For the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(v)	25
For the contents described in 5(b)(1)(iv) (Core 2) and 5(b)(1)(v) (Core 2) and limited in 5(b)(2)(iii)	0

6. Deleted.

7. For shipments involving the contents specified in 5(b)(1)(viii) 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).

9. Container number three (M-130-3) has been modified by adding two 4-inch thick by 8-inch wide steel plates welded between fins 25 and 50 and between fins 110 and 135 at approximately 14.75 inches from the bottom of the container. The cooling fins in this localized area are removed to permit attachment of the plate directly to the outer shell of the container.

10. Container number four (M-130-4) has been modified by adding a 2-inch thick by 4-inch wide steel plate welded between fins 32 and 49 at approximately 18.4 inches from the bottom of the container. The cooling fins in this localized area are removed to permit attachment of the plate directly to the outer shell of the container.

11. Containers M-130-3, M-130-4, M-130-6, and M-130-7 may be used for the contents specified in 5(b)(1)(viii) and 5(b)(1)(x) only. Containers M-130-10 and M-130-15 may be used for the contents specified in 5(b)(1)(viii), 5(b)(1)(x), and 5(b)(1)(xviii) only.

12. Container M-130-11 may be used for the contents specified in 5(b)(1)(xvi) only.

13. Deleted.

14. Expiration date: September 30, 2002.

REFERENCES

Safety analysis report for M-130 shipping container, MAO-E8-703 dated December 30, 1968.

Supplements: Naval Reactors (NR) letters A#2256 dated February 24, and G#1931 dated March 3, 1969; General Electric Company (GE) letter ONP-74520-526 dated April 3, 1972; NR letter G#3207 dated April 27, 1972; GE letter ONP-74520-528 dated April 28, 1972; NR letter G#3250 dated June 6, 1972; GE letters ONP-74570-635 dated October 25, ONP-74570-654 dated December 4, and ONP-14570-666 dated December 12, 1972; ONP-74570-682 dated January 12, ONP-74570-698 dated January 31, ONP-74570-687 dated February 6, ONP-74390-65 dated March 26, and DLGN-85570-854 dated September 24, 1973; and DLGN-85570-901 dated January 10, 1974; NR letter G#4061 dated January 29, 1974; GE letters DLGN-85570-924 dated February 15, DLGN-85570-923 dated March 6, and DLGN-85570-969 dated May 24, 1974; NR letter G#4991 dated November 25, 1975; GE letters ONP-74340-JTT-73 dated December 17, 1975; CGN-85570-1145 dated September 9, CGN-85570-1146 dated September 10, and CGN-85570-1148 dated September 14, 1976; Bettis Atomic Power Laboratory letters WAPD-R(K)-1378 dated August 30, 1976, and WAPD-OP(PP)S-4401 dated June 29, 1979; NR letters G#6197 dated July 13, 1979, G#7022 dated July 14, WAPD-LP-(CES)SE-170 dated July 1981; and WAPD-LD-(CES)SE-181 dated September 1981; WAPD-LP(CES)SE-96 dated February 1982, G#7136 dated March 17, 1982; G#7160 dated May 18, 1982; G#7582 dated September 7, 1983; G#C87-5692 dated September 2, and G#C87-5689 dated September 23, 1987; G#C87-8008 dated January 19, G#C88-5931 dated May 12, and G#C88-5961 dated July 25, 1988; G#C89-2825 dated March 29, and G#C89-2863 dated August 11, 1989; G#C92-03392 dated March 30, and G#92-03729 dated October 20, 1992; G#C93-10935 dated October 8, 1993; G#96-03344 dated March 6, and G#96-03610 dated December 9, 1996; G#97-03543 dated July 10, and G#C97-03685 dated December 19, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles J. Haughney, Acting Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: March 12, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6058	13	USA/6058/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Cintichem, Inc., application dated March 31, 1985, as supplemented.

c. DOCKET NUMBER 71-6058

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, plug type 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 construction 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.

(3) Drawing

The packaging is as described and constructed in accordance with Cintichem, Inc. Drawing No. 330E2053E, Revision E.

(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 525°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 525°F, packaged within a nominal 1/2-inch thick (24-inch OD) polyethylene High Intergity 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 A_2 quantities of solidified liquid radioactive material and not more that 50 A_2 quantities of other radioactive materials. The maximum thermal decay heat load must not exceed 15 watts.

For the fissile contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii) not to exceed the following:

Fissile Material	Maximum per Package (grams)
U-235	350
U-233	200
Plutonium*	200

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.

5. (c) Transport Index for Criticality Control

For contents containing special nuclear material:

Minimum transport index to be shown on label for nuclear criticality control: 10.0

6. For gamma-emitting special form materials, at least 5 inches of additional lead shielding may be added as required 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. Prior to the shipment of contents described in 5.(b)(1)(i), the package must be leak tested as specified in Section I of the application.

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

(a) Each package shall be maintained in accordance with Section I of the application, as supplemented; and

(b) Each package shall be operated and prepared for shipment in accordance with Section I of the application, as supplemented.

11. Fabrication of additional packagings is not authorized.

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: December 31, 2000.

REFERENCES

Cintichem, Inc. application dated March 31, 1985.

Supplements dated: August 30 and October 31, 1985, and October 2 and November 27, 1990.

Department of Energy supplements dated July 15 and December 21, 1992, and November 20, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 3/22/96

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6078	28	71-6078	USA/6078/AF	1	OF	3

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Combustion Engineering, Inc. application dated July 9, 1996, as supplemented.

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. The fuel bundles are separated by 3/16" thick, high carbon steel segmented separator blocks permanently attached to the strongback. The segmented separator blocks are 6" x 8" and are installed (welded) in segments to form a continuous block for the entire active length of the fuel assembly. The Model No. 927A1 package is approximately 43" in diameter by 189" long with an approximate gross weight of 6,700 lbs. The Model No. 927C1 package is approximately 43" in diameter by 216" long with an approximate gross weight of 7,300 lbs.

(3) Drawings

The Model Nos. 927A1 and 927C1 containers are constructed in accordance with Combustion Engineering, Inc. Drawing No. L-6078-01, Sheets 1 through 4, Rev. 4.

(b) Contents

(1) Type and form of material

(i) Model No. 927A1: unirradiated 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 with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 19.6 kg U-235.

5.(b) (1) Contents (Continued)

(ii) Model No. 927A1: unirradiated fuel bundles consisting of 0.381" diameter uranium dioxide fuel pellets clad in 0.026" 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 with a maximum 4.76 w/o enrichment in the U-235 isotope, and contains not more than 19.6 kg U-235.

(iii) Model No. 927A1: unirradiated fuel bundles consisting of 0.33" diameter uranium dioxide fuel 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 with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 20.76 kg U-235.

(iv) Model No. 927A1: unirradiated fuel bundles consisting of 0.31" diameter uranium dioxide fuel pellets clad in 0.024" thick zircaloy tubes in a 16 x 16 square array with a 0.472" pitch. Each fuel bundle consists of a maximum of 231 fuel rods with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 11.68 kg U-235.

(v) Model No. 927C1: unirradiated fuel bundles consisting of 0.33" 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 with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 22.77 kg U-235.

(vi) Model No. 927C1: unirradiated fuel bundles consisting of 0.324" diameter uranium dioxide fuel pellets clad in 0.0235" thick zircaloy tubes in a 17 x 17 square array with a 0.501" pitch. Each fuel bundle consists of 264 fuel rods with a maximum 3.6 w/o enrichment in the U-235 isotope, and contains not more than 16.43 kg U-235.

(2) Maximum quantity of material per package

Model No. 927A1: Two fuel bundles weighing not more than 1400 lbs. each.

Model No. 927C1: Two fuel bundles weighing not more than 1506 lbs. each.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 15.7

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

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application, as supplemented.

   (b) The packaging must be maintained in accordance with the Maintenance Program of Chapter 8 of the application, as supplemented.

8. Fabrication of additional packagings is not authorized.

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, 2005.

REFERENCES

Combustion Engineering, Inc. application dated July 9, 1996.

Supplements dated May 7, June 2, June 5, June 19, July 31 and August 14, 1998.

ABB Combustion Engineering Nuclear Power, Inc. supplement dated June 10, 1999.

ABB C-E Nuclear Power, Inc. supplements dated: March 28, and April 4 and 12, 2000.

CE Nuclear Power, LLC supplements dated: September 7 and 14, 2000.

Westinghouse Electric Company LLC supplement dated: September 18, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: October 10, 2000

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Framatome Cogema Fuels
P.O. Box 11646
Lynchburg, VA 24506-1646

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

B&W Fuel Company application
dated April 23, 1990, as supplemented.

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. Gross weight of the loaded container not to exceed 7,600 pounds.

(3) Drawings

The container is constructed in accordance with Framatome Cogema Fuels Drawing Nos. 1273422, Rev. 0; 1273423, Rev. 0; 1273424, Rev. 0; 1273425, Rev. 0; 1273426, Rev. 0; and 1273427, Rev. 0.

(b) Contents

(1) Type and form of material

Unirradiated, sintered UO_2 pellets in fuel rods. The maximum inner diameter and the minimum outer diameter of the fuel rod cladding, guide tubes and instrument tubes are in accordance with Table 3 of B&W Fuel Company supplement dated October 27, 1995; and the minimum guide tube outer diameter and minimum wall thickness are in accordance with Framatome Cogema Fuels supplement dated February 7, 1996. The locations of the guide tubes and instrument tubes are in accordance with Figures 2 through 5 of B&W Fuel Company supplement dated October 27, 1995. The rods are assembled into fuel assemblies. The fuel assemblies may contain inserted control rod assemblies.

5. (b)(1) Contents (continued)

Fuel assemblies as described above have the following specifications:

Assembly Type	15x15	15x15	15x15	17x17	17x17	15x15
No. fuel rods	208	208	208	264	264	204
No. non-fuel tubes	17	17	17	25	25	21
Fuel rod pitch, in.	0.568	0.568	0.568	0.496	0.502	0.563
Maximum fuel pellet OD, in.	0.3707	0.3742	0.3622	0.3232	0.3252	0.3671
Tube material	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4
Maximum active fuel length, in.	144	144	144	145.825	144	144
Maximum enrichment w/o U-235	5.05	5.05	4.98	5.05	5.05	5.05
Maximum U-235 Loading (kg)	25.1978	25.6758	23.7220	24.3108	24.6126	24.2355

(2) Maximum quantity of material per package

Two fuel assemblies. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 6.3

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 bow clamp to restrain each spacer grid and end fitting. The ratio of assembly weight to the number of clamp bows must not exceed 168 pounds per clamp.

8. The weight of the contents (fuel assemblies, control rods, spacers, etc.) must not exceed 3,360 pounds.

9. Fabrication of additional packagings is not authorized.

10. In addition to the requirements of Subpart G of 10 CFR Part 71, the package shall be operated and maintained in accordance with Section 7.0 of the application, as supplemented.

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, 2005.

REFERENCES

B&W Fuel Company application dated April 23, 1990.

Supplements dated: July 23, 1990; May 4, August 18, August 25, and October 14, 1992; September 24, 1993; and April 8, May 2, and November 23, 1994; February 26, March 17, April 7, July 31, October 27, and December 1, 1995.

Framatome Cogema Fuels supplements dated February 7, 1996 and January 20, March 19 and 26, and il 17, 1998, and August 29, and September 8, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: September 28, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6280	7	USA/6280/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

J. L. Shepherd and Associates
1010 Arroyo Avenue
San Fernando, CA 91340

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

J. L. Shepherd and Associates application dated September 5, 1979, as supplemented.

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 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, dated June 6, 1969; A-0109-10, dated February 3, 1970; A-0109-20, dated February 5, 1970; A-0117-B, change D (not dated); A-0117-C, dated April 2, 1970; and A-0117-C1, dated April 2, 1970.

5. (b) Contents

(1) Type and form of material

Cobalt-60 as metal, doubly encapsulated and heliarc welded in stainless steel. The source(s) is in an annular configuration approximately 6 inches in diameter by 6 inches long. The source(s) must meet the requirements for 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 fires.

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

(a) The package must be maintained in accordance with the Maintenance Program described in the J. L. Shepherd and Associates submittal dated February 2, 1990.

(b) The package must be prepared for shipment and operated in accordance with the Operating Procedures described in the J. L. Shepherd and Associates submittal dated February 2, 1990.

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, 2005.

REFERENCES

J. L. Shepherd and Associates' application dated September 5, 1979.

Supplements dated: November 29 and December 31, 1984, January 16, 1985, November 22, 1989, February 2, 1990, December 6, 1994, and December 29, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date March 2, 2000

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6294	25	71-6294	USA/6294/AF	1	OF	4

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Combustion Engineering, Inc. application dated July 27, 1990, as supplemented.

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 or ceramic sheet, plywood, hardboard, and insulating material. Gross weight of the package is 660 pounds.

(3) Drawings

The packaging is constructed in accordance with Combustion Engineering, Inc., Drawing Nos. D-5007-8086, Rev. 6, and B-5007-8112, Rev. 1.

(b) Contents

(1) Type and form of material

(i) Sintered uranium oxide pellets and rejected pellets enriched to a maximum 5.0 w/o in the U-235 isotope.

(ii) Uranium oxide as powder enriched to a maximum 5.0 w/o in the U-235 isotope.

(iii) U_3O_8 powder, placed in polyethylene bags then pressed and compacted into blocks, with a maximum enrichment of 4.5 w/o in the U-235 isotope. Water may be injected into the blocks.

5. (b) Contents (cont'd.)

(2) Maximum quantity of material per package

Maximum weight of contents within the inner container is 427 pounds, including radioactive material, secondary containers, and other packaging material.

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

320 pounds of pellets, with the U-235 content not to exceed 6.4 kg. Pellets must be packaged in trays in accordance with Combustion Engineering, Inc. Drawing Nos. D-5018-2001, Rev. 1, and NFM-D-4263, Rev. 2, or NFM-E-4661, Rev. 2 and NFM-D-4721, Rev. 1. Trays containing pellets must contain a maximum of 9.07 kg and a minimum of 6.7 kg of pellets with a maximum pellet diameter of 0.4 inch.

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

220 pounds of powder, with the U-235 content not to exceed 1.5 kg. Powder must be packaged in secondary containers in accordance with Combustion Engineering, Inc. Drawing Nos. NPM-C-3389, Rev. 0 or Rev. 3, and NFM-D-4750, Rev. 1.

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

30.4 kg of U_3O_8, with the U-235 content not to exceed 1.15 kg per package. The U_3O_8 blocks shall be placed in perforated aluminum cans, which shall then be packaged in secondary containers in accordance with Combustion Engineering, Inc. Drawing Nos. NPM-C-3389, Rev. 0 or Rev. 3, and NFM-D-4750, Rev. 1.

(c) Transport Index for Criticality Control

(1) For the material described in Items 5(b)(1)(i) and 5(b)(1)(ii):

Minimum transport index to be shown on label for nuclear criticality control: 0.5

(2) For the material described in Item 5(b)(1)(iii):

Minimum transport index to be shown on label for nuclear criticality control 1.3

6. Prior to each shipment the insert (containment vessel) gasket shall be inspected. This gasket shall be replace if inspection shows any defects.

7. For the contents specified in 5(b)(1)(i), the pellet trays and wood spacers must provide a snug axial and cross sectional fit in the inner container. For packages with fewer than 16 loaded pellet trays, wood spacers or pellet trays with wood spacers inside must be substituted for pellet trays.

8. For the contents specified in 5(b)(1)(ii), powder cans and wood spacers must provide a snug axial and cross sectional fit in the inner container. For packages with fewer than two loaded powder cans, a wood spacer or a powder can with a wood spacer must be substituted for the powder can.

9. For the contents specified in 5(b)(1)(iii), the packaging may be constructed in accordance with Combustion Engineering, Inc., Drawing Nos. D-5018-8454, Rev. 1 and D-5007-8112, Rev. 1.

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

    (i) Each packaging must meet the acceptance tests and be maintained in accordance with Chapter 8 of the application; and

    (ii) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application, as supplemented.

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, 2001.

REFERENCES

Combustion Engineering, Inc. application dated July 27, 1990.

Supplements dated: October 19, 1990; January 27, and July 28, 1994; August 17, 1995; and July 14, 1998.

ABB Combustion Engineering Nuclear Power, Inc., supplement dated June 10, 1999.

ABB C-E Nuclear Power, Inc. supplements dated: March 28, and April 4 and 12, 2000.

REFERENCES con't.

CE Nuclear Power, LLC supplement dated: September 14, 2000.

Westinghouse Electric Company LLC supplement dated: September 18, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: October 10, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6346	27	USA/6346/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Chem-Nuclear Systems, L.L.C.
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Public Service Company of Colorado application dated March 28, 1996, 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 FSV-1 is a stainless steel-encased, depleted uranium-shielded cask. The cask body is a cylinder 208-inches long and 28 inches in diameter, except for the top flange area, which is 31 inches in diameter. The cavity is approximately 17.7 inches in diameter and 187.6-inches long.

The cask may be used in one of seven configurations (A through G) depending on contents. Configurations A, B, C, and D are used to ship solid, non-fissile irradiated hardware. These configurations use an outer lid consisting of a 3.75-inch thick stainless steel plate and a 2.25-inch thick depleted uranium shield. The lid is bolted to the cask body by 24 1.25-inch diameter fasteners. The primary seal is a silicone elastomeric seal ring between the outer lid and cask body. Configuration B does not require an inner container. Configuration C uses a supplemental stainless steel shield ring and cover plate. Configuration D uses a supplemental carbon steel shield ring and cover plate.

Configuration E is used to ship Fort St. Vrain (FSV) high temperature gas reactor (HTGR) fuel elements. This configuration uses the stainless steel inner container (as shown in General Atomic Drawing Nos. GADR 55-2-1, Rev. C, and GADR 55-2-2, Rev. A) as the containment vessel. The inner container lid is a stainless steel shell containing depleted uranium 4.15-inches thick. The inner lid is secured to the inner container body by 12 0.5-inch diameter fasteners. The primary seal is a silicone elastomeric seal ring between the inner lid and inner container body. Configuration E is equipped with an impact limiter on the upper end.

Configurations F and G are used to ship solid non-fissile irradiated and contaminated hardware from the FSV HGTR. These configurations use a 4.75-inch thick steel outer lid. The lid is secured to the cask body by 24 1.25-inch diameter fasteners. The primary seal is a molded silicone elastomeric seal ring between the outer lid and cask body. Configurations F and G both use an impact limiter on the upper end. Configurations F and G also use a burial canister with a 12-inch thick carbon steel plug. The shielded spacer in the burial canister is used only in Configuration G.

The overall weight for the FSV-1 package is 46,025 pounds for Configurations A, B, C, and D and 47,600 pounds for Configurations E, F, and G.

(3) Drawings

The FSV-1 package is constructed in accordance with the following drawings:

Configuration A

National Lead Company Drawing Nos.: 70086F, Rev. 7; 70296F, Rev. 2; and General Atomics Drawing No. 1501-003, Rev. C.

Configuration B

Same as for Configuration A except that an inner container is not required.

Configurations C and D

In addition to the drawings for Configuration A, General Atomics Drawing Nos. GADR 55-2-10, Issue D, and GADR 55-2-14, Issue N/C (optional). Configuration C uses a supplemental stainless steel shield ring and cover plate constructed in accordance with Drawing No. GADR 55-2-11, Issue B. Configuration D uses a supplemental carbon steel shield ring and cover plate constructed in accordance with Drawing No. GADR 55-2-11, Issue A.

Configuration E

In addition to the drawings for Configuration A, General Atomic Drawings Nos. GADR 55-2-1, Issue C; GADR 55-2-2, Issue A; and GADR 55-2-3, Issue B.

Configurations F and G

In addition to the drawings for Configuration A, General Atomic Drawings Nos. GADR 55-2-1, Issue C; GADR 55-2-2, Issue A; GADR 55-2-12, Issue C; and GADR 55-2-13, Issue A.

5. (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. Prior to irradiation, each fuel element contains thorium and uranium enriched to a maximum of 93.5 w/o in the U-235 isotope, or

(ii) Solid, irradiated, and contaminated hardware, which may include fissile material, provided the quantity of fissile material does not exceed a Type A quantity and does not exceed the mass limits of 10 CFR §71.53 and neutron source components, or

(iii) Solid, nonfissile, irradiated and contaminated hardware which has been removed from the Fort St. Vrain High Temperature Gas Cooled Reactor and the surface contamination does not exceed 51 millicuries per package.

(2) Maximum quantity of material per package

Decay heat not to exceed 4.1 kw and:

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

Six fuel elements each containing a maximum of 1.4 kg of enriched uranium, having a thorium/uranium ratio greater than 8.1:1 and weighing approximately 300 pounds. The gross weight of the cask cavity contents, including the component spacers, inner container, and irradiated fuel elements shall not exceed 4,430 pounds. Contents must be shipped in Configuration E.

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

The gross weight of the cask cavity contents, including appropriate component spacers, liners, inner containers, shield rings and solid, nonfissile, irradiated and contaminated hardware shall not exceed 3,720 pounds. Contents must be shipped in Configurations A, B, C, or D.

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

The gross weight of all of the cask cavity contents, including burial canister and spacers, with or without supplemental shielding shall not exceed 4,430 pounds. Contents must be shipped in Configurations F or G.

5. (c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. As needed, appropriate component spacers must be used in the cask cavity when shipping the contents described in paragraph 5(b) to limit movement of contents during shipment.

7. For transport of the contents of Item (b)(1)(ii) in Configuration D, the dose rate measured 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.

8. The Model No. FSV-1 cask may be wrapped with reinforced plastic when shipping the contents described in Item 5(b)(1)(ii) or (iii) provided the heat generation rate does not exceed 500 watts. The applicable requirements of 10 CFR §71.87 must be satisfied prior to wrapping the cask.

9. Use of packaging fabricated after August 31, 1986, is not authorized.

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

(a) Configurations A, B, C, and D of the Model FSV-1 shipping cask shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0, Volume I, of the application, as supplemented. The package shall be maintained in accordance with the Maintenance Program in Section 8.0, Volume I, of the application, as supplemented.

(b) Configurations E, F, and G of the Model FSV-1 shipping cask shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0, Volume II, of the application, as supplemented. The package shall be maintained in accordance with the Maintenance Program in Section 8.0, Volume II, of the application, as supplemented.

(c) The main flange seals must be replaced within twelve (12) months prior to any use of the packaging and must be replaced if inspection shows any defect.

(d) The silicone O-ring on the inner container primary plug in Configuration E must be replaced within the twelve (12) months prior to any use of the packaging and must be replaced if inspection shows any defect.

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

12. Effective date: June 13, 1997 Expiration date: May 31, 2001.

REFERENCES

Public Service Company of Colorado application dated March 28, 1996, as supplemented by Chem-Nuclear Systems, L.L.C. letter dated May 19, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William F. Kane, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 10, 1997

CORRECTED PAGE 5

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6347	9	USA/6347/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
3550 General Atomics Court
San Diego, CA 92186

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.

(b) Contents

(1) Type and form of material

Unirradiated fuel element consisting of a graphite body, hexagonal in transverse cross-section approximately 14.2" across the flats and 31.2" high. Dispersed 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. Total quantity of radioactive material within a package may not exceed a Type A quantity.

5. (c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 1.3

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

(i) The package must be operated and prepared for shipment in accordance with the operating procedures of Chapter 6 of the application.

(ii) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 7 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, 2002.

REFERENCE

General Atomic Company application dated February 19, 1982.

Supplements dated: March 9, 1982, February 24, 1992, and February 28, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 19, 1997

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6357	7	USA/6357/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company application dated February 28, 1991.

c. DOCKET NUMBER 71-6357

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

The packaging consists of a containment vessel, 5-9/16 inches OD by 22-3/8 inches high, constructed from a 5-inch scheduled 40 steel pipe with a screw-type cap and a welded bottom plate. The containment vessel is centered and supported in a 55-gallon DOT specification 17C or 6C steel drum by industrial cane fiberboard.

The nominal gross weight of the packaging and contents is 350 pounds.

(3) Drawing

The packaging is constructed in accordance with Babcock and Wilcox Fuel Company Drawing No. 1198767E.

5.(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. Maximum quantity of radioactive material within the package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control

Minimum Transport index to be shown on label for nuclear criticality control: 2.1

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

(a) Each package must meet the Acceptance Tests and Maintenance Program in Chapter 8 of the application.

(b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 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, 2001.

REFERENCES

Babcock & Wilcox application dated February 28, 1991.

Supplement dated: March 21, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 4/23/96

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6386	15	USA/6386/B(U)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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

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 AIG/A4W type. Subsequently, the container has been adapted to ship 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 DIG fuel modules, and rodded or unrodded D2W fuel cells. The loaded container maximum weight is 12,200 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.

5.(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following types:

(i) A1G reactor cell without upper mechanism and with control rod, leadscrew and shipping fixture installed on rodded type modules.

5.(b)(1) continued

(ii) Standard size S8G reactor cluster with regular or substitute support adapters and regular control rods. If only one cell is shipped per container, a dummy load shall be installed for balance.

(iii) Partial size S8G reactor cluster with regular or substitute support adapters and regular control rods. If only one cell is shipped per container, a dummy load shall be installed for balance.

(iv) S3G-3 refueling cells, with a maximum of one 0-1 reactor cell assembly per container.

(v) D1G fuel module, rodded.

(vi) D1G removable fuel assembly (RFA), unrodded.

(vii) A1G fuel cluster, fueled end only of full A1G reactor cell, rodded. This fuel assembly type is not authorized for transport.

(viii) D2W side or central fuel cells with control rod and control rod holddown device.

(ix) D2W corner fuel cells, without shear blocks, unrodded.

(x) D2W side or central fuel cell and shear block with control rod inserted in rodded fuel cell.

(xi) D2W corner fuel cell, with shear block, unrodded.

(2) Maximum quantity of material per package

(i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(x), or 5(b)(1)(xi).

(ii) Two fuel assemblies as described in 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(ix).

(iii) Four fuel assemblies as described in 5(b)(1)(vi).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1) For the contents described in 5(b)(1)(vii) and limited in 5(b)(2)(ii): Not authorized for transport.

5.(c) continued

(2) For the contents described in 5(b)(1)(viii), 5(b)(1)(ix), and limited in 5(b)(2)(ii).: 50.0

(3) For contents 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)(x), and 5(b)(1)(xi) and limited in 5(b)(2)(i), 5(b)(2)(ii), and 5(b)(2)(iii): 25.0

6. Expiration date: April 30, 2005.

REFERENCES

Safety Analysis Report for 235R001 Shipping Container, WAPD-OP(R)RD-357 dated August 11, 1970.

Supplements: Knolls Atomic Power Laboratory letter A1G 25-159, dated October 2, 1970. Bettis Atomic Power Laboratory letters WAPD-0P(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 A1G 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; G#6813, dated October 17, 1980; G#C85-0467, dated July 17, 1985; G#C88-8112, dated October 18, 1988; G#90-03655, dated August 10, 1990; G#92-03560, dated June 15, 1992; G#96-03371, dated March 15, 1996, G#C97-03444 dated April 8, 1997, G#C99-03514, dated June 1, 1999, and G#C99-03688, dated December 30, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges
for

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

Dated: 31 March, 2000

NRC FORM 618
(3-96)
10 CFR 71

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
6400	25	USA/6400/B( )F	1	9

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company
LLC (WELCO)
P.O. Box 355
Pittsburgh, PA 15230-0355

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

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. E.G.-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.

5.(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 cm^2 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 cm^2. Outer surfaces must have a smearable level of contamination of no greater than 20 dpm/100 cm^2. 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.

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.

5.(b) Contents (continued)

(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 cm^2 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 cm^2. 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 d/m/100 cm^2. The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

5.(b) Contents (continued)

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).

5.(b) Contents (continued)

(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.

5.(b) Contents (continued)

(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.

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* 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 8, 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.

5.(b) Contents (continued)

(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)POB-591 (January 1984); and

(iv) The decay heat generation from the source material must not exceed one watt.

(10) Compressed krypton-85 gas in mixture with other non-radioactive gases that are chemically compatible with the 3AA2015 cylinder. No fissile material (Requirement of 5.(c) does not apply). Shipment of krypton-85 gas is subject to the following limitations:

(i) Radioactivity not to exceed 2,700 curies. Maximum internal decay heat not to exceed 15 watts. Maximum volume of krypton-85 and other non-radioactive gases shall not exceed 1480 liters at STP (1 atm, 25°C);

(ii) The maximum initial fill pressure shall not exceed 500 psig at 25°C;

(iii) The DOT Specification 3AA2015 gas cylinder shall be certified for an operating load of 2,015 psig, at least once every 5 years by testing to 3,360 psig;

(iv) A minimum of 24 hours after loading with krypton-85 gas the krypton packaging primary containment shall have a leak rate of less than 0.0014 microcuries per second. The leak test shall be performed with the containment vessel within the lead shield container prior to placement within its thermal overpack;

(v) Content of the package shall be verified by mass spec analysis;

(vi) Acceptance, maintenance and use of the krypton package shall be in accordance with the procedures and requirements of Chapter 7 and 8 of Westinghouse Idaho Nuclear Company, Inc. Report No. WIN-236, Revision 1, March 1988. The retaining ring shall be tightened around the gas cylinder to a 40 to 50 inch-pound torque;

(vii) The position and securement of the krypton package within the Model No. 6400 is as specified in Westinghouse Idaho Nuclear Company, Inc. Drawing No. 059888;

(viii) Krypton package must be enclosed within a tight fitting plywood box constructed in accordance with Westinghouse Idaho Nuclear Company, Inc. Drawing No. 059886.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

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. Contents packaged under the conditions of this certificate of compliance are exempt from the requirements of 10 CFR §71.63. Condition 5(c) of this certificate of compliance is not applicable where the fissile material is excluded as provided by 10 CFR §71.53.

13. In addition to the requirements of Subpart G of 10 CFR Part 71, the package must be prepared for shipment, operated, and maintained in accordance with "Operating Inspection and Maintenance Procedure No. CSK-003, Rev. 0," included in the Westinghouse Electric Corporation supplement dated April 14, 1992.

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: July 31, 2002.

REFERENCES

Westinghouse Electric Corporation application dated August 7, 1981.

General Electric Company supplement dated: October 1, 1981.

Babcock and Wilcox Company supplements dated: March 8, 1982; and January 10, 1985.

Department of Energy, Division of Naval Reactors, supplements dated: April 22, and July 8, 1983; and March 5, 1984.

Department of Energy, Chicago Operations Office, supplement dated: April 15, 1983.

Department of Energy, Washington, DC, supplement dated: June 6, 1988.

Westinghouse Electric Corporation supplements dated: April 14, 1992; and April 14, 1997.

Westinghouse Electric Company, Division of CBS Corporation supplement dated: December 22, 1997, September 28, 1998 and February 22, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 3/3/99

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6406	11	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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.

(v) Rodded instrumented S1C fuel module in the Model No. 7481E12 shipping container.

(vi) S1C fuel module or S1C peripheral assembly in the Model No. S1C 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.

5.(b) Contents (Continued)

(1) Type and form of material (Continued)

(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. 658H1AB 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.

(xxi) 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.

5.(b) Contents (Continued)

(1) Type and form of material (Continued)

(xxiii) S5G Central Subassembly

(xxiv) S3G-3 Removable Noninstrumented Fuel Assembly (RNFA) in a Model No. 95K-218 shipping 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)(xvi), 5(b)(1)(xvii), 5(b)(1)(xviii), 5(b)(1)(xix), 5(b)(1)(xx), 5(b)(1)(xxii), 5(b)(1)(xxiii), and 5(b)(1)(xxiv).

(ii) Two fuel assemblies as described in 5(b)(1)(xv).

(iii) Three fuel assemblies as described in 5(b)(1)(xxi).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1)	For the contents described in 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), 5(b)(1)(xxii), 5(b)(1)(xxiii), and 5(b)(1)(xxiv), and limited in 5(b)(2)(i), 5(b)(2)(ii), and 5(b)(2)(iii):	100
(2)	For the contents described in 5(b)(1)(iii), 5(b)(1)(v), 5(b)(1)(ix), 5(b)(1)(x), and 5(b)(1)(xviii), and limited in 5(b)(2)(i):	62.5
(3)	For the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(i):	41.7
(4)	For the contents described in 5(b)(1)(vii) and limited in 5(b)(2)(i):	31.3
(5)	For the contents described in 5(b)(1)(xvi) and limited in 5(b)(2)(i):	12.5
(6)	For the contents described in 5(b)(1)(i) and limited in 5(b)(2)(i):	41.7
(7)	For the contents described in 5(b)(1)(ii) and limited in 5(b)(2)(i):	100

6. Expiration date: July 31, 2002.

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; G#7609 dated September 30, 1983; G#C85-0435 dated April 19, 1985; G#C87-8027 dated December 23, 1987; G#92-03690 dated September 11, 1992; and G#97-03513 dated June 11, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 07/23/97

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6441	7	USA/6441/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

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.

The Type D or E power unit are retained in the container by means of eight shipping bolts. 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 are restrained in the 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.

5. (b) Contents

(1) Type and form of material

Unirradiated enriched uranium as contained in Naval Reactors Type 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) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Expiration date: August 31, 2002.

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; Knolls Atomic Power Laboratory letter CGN 85542-250, dated February 5, 1981; Naval Reactors letter NR:RR:ESSNIDER G#92-03731, dated October 7, 1992; and Naval Reactors letter NR:RR:SLDUNN G#97-03543, dated July 10, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: August 25, 1997

NRC FORM 618
(6-2000)
10 CFR 71

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6553	17	USA/6553/AF	1	3

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

United States Enrichment Corp
6903 Rockledge Drive
Bethesda, MD 20817

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, Revision 1, dated October 28, 1998, as supplemented.

c. DOCKET NUMBER 07106553

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 No. 48X 10-ton cylinder. The cylinder is welded steel, and is 48 inches in diameter, 121 inches long, and has a 5/8-inch thick wall. The cylinder has a 108.9 ft^3 volume, and is 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 and a 2-inch thick aluminum stiffening 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. Four, 2-inch bolts are used in conjunction with the ISO corner fittings for tie-down. The maximum gross weight of the package is 40,000 pounds.

(3) Drawings

The Paducah Tiger overpack is constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-1209-NRC-1, Rev. 0, M-1209-NRC-2, Rev. 0, M-1209-NRC-3, Rev. A, M-1209-NRC-4, Rev. 1, and M-1209-NRC-5, Rev. 0.

PRINTED ON RECYCLED PAPER

(b) Contents

(1) Type and form of material

Solid uranium hexafluoride (UF_6) at not more than 4.5 w/o 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 640 pounds (290 kg).

(3) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.0

6. Each Model No. 48X cylinder must be inspected, tested, maintained, assembled, and used in accordance with American National Standards Institute (ANSI) N14.1-1990. The cylinders must be designed and fabricated in accordance with ANSI N14.1-1990 or an earlier version of ANSI N14.1 in effect at the time of fabrication. The cylinders must be fabricated in accordance with Section VIII, Division I, of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code and must be ASME Code stamped. Except that the 48X cylinders manufactured by W.H. Stewart Company in accordance with ANSI N14.1-1971 after ANSI N14.1-1982 was approved may be used for shipment in the Paducah Tiger package provided that they are inspected, tested and re-certified in accordance with ANSI N14.1-1990.

7. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be maintained, repaired, operated and prepared for shipment in accordance with Operating Instructions and Acceptance Tests and Maintenance Program in the application dated October 28, 1998, as supplemented December 21, 1998, June 7, 1999, and February 29, 2000.

8. Use of Model No. 48A cylinders is not authorized.

9. Use of Model No. 48X cylinders made of A-285 steel is not authorized.

10. The Model 48X cylinder valve stem and plug may be tinned with ASTM B32, alloy 50A or Sn50 solder material, or a mixture of alloy 50A or Sn50 with alloy 40A or Sn40A material, provided the mixture has a minimum tin content of 45 percent.

11. Paducah Tiger overpacks previously constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-1209-NRC-1, Rev. C; M-1209-NRC-2, Rev. A, M-1209-NRC-3, Rev. A; and M-1209-NRC-4, Rev. A, may be used until September 10, 1999. For the overpacks authorized by this condition, the clearance distance between the end of the cylinder valve and the plane of the end of the cylinder skirt must be measured prior to each shipment. The clearance distance must be at least 3/8 inch.

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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: July 31, 2004.

REFERENCES

Safety Analysis Report on the "Paducah Tiger" Protective Overpack for 10-Ton Cylinders of Uranium Hexafluoride, Union Carbide Corporation Report No. KY-665, Revision 1, Dated October 28, 1998.

Supplements dated: December 21, 1998, January 12 and June 7, 1999, February 29, 2000, and June 12, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 12, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6574	26	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

ATG Nuclear Services, LLC
669 Emory Valley Road
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Scientific Ecology Group, Inc., application dated December 27, 1990, 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.: 3-82B

(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 11-gauge steel.

The lid, sealed by a silicone flat gasket, is bolted to the cask body. A cylindrical shield plug is located in the center of the cask lid and is sealed by a silicone flat gasket. Lifting and tie-down devices are attached to the cask body. Impact skirts, consisting of removable rings of shock absorbing foam, are attached to the ends of the cask.

(3) Drawings

The package is fabricated in accordance with the following Scientific Ecology Group, Inc. Drawing No.: STD-02-076, Sheets 1 through 3, Revision 7.

(b) Contents

(1) Type and form of material

Byproduct material consisting of dewatered, solid radioactive waste, including spent ion exchange resins, filter sludges, solidified evaporator concentrates, spent filter cartridges, and contaminated or irradiated solid materials.

(2) Maximum quantity of material per package

Greater than Type A quantity of byproduct material, which may contain not more than a Type A quantity of 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 pallet. Drums to be constructed of metal or high integrity plastic with a tightly fitted cover. A maximum decay heat 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 or by analysis 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/ft^3 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 a hydrogen concentration 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 total weight of the package must not exceed 50,000 pounds and the weight of the contents (including dunnage, etc.) must not exceed 8,195 pounds.

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

   (a) The package shall be prepared for shipment and operated in accordance with Operating Procedure STD-P-02-024, Rev. 3, in the supplement dated March 7, 1996.

   (b) The package shall be maintained in accordance with the maintenance program in the supplement dated March 13, 1991.

9. 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.

10. Prior to each shipment, the 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 12 months, whichever occurs first.

11. The packaging must be leak tested in accordance with Section 8.2.2 of the application. For contents that meet the definition of low specific activity material or surface contaminated objects in 10 CFR §71.4, and also meet the exemption standard for low specific activity material and surface contaminated objects in 10 CFR §71.10(b)(2), the pre-shipment leak test is not required.

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

13. Expiration date: May 31, 2001.

REFERENCES

Scientific Ecology Group Incorporated application dated December 27, 1990.

Supplements dated: March 13, 1991; March 7, 1996; and October 10, 1997.

ATG Nuclear Services, LLC, supplements dated: December 1, 1998; August 9 and 11, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 1/11/00

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6581	29	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Siemens Power Corporation
2101 Horn Rapids Road
Richland, WA 99352-0130

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Advanced Nuclear Fuels Corporation application dated October 15, 1990, as supplemented.

c. DOCKET NUMBER

71-6581

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.: 51032-1

(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. Steel separator blocks are bolted between fuel assemblies. The separator blocks are a minimum 6 inches wide by approximately 8 inches high and 9 inches long, with a minimum nominal 3/8-inch thick wall. The outer container is approximately 43 inches in diameter by 216 inches long. The maximum weight of the package, including contents, is 7,400 pounds.

(3) Drawings

The packaging is constructed and assembled in accordance with the following Siemens Power Corporation Drawing Nos.:

EMF-309,813, Rev. 2, Sheets 1 and 2
EMF-303,359, Rev. 7
EMF-303,360, Rev. 6
EMF-303,898, Rev. 5
EMF-300,607, Rev. 3
EMF-309,582, Rev. 0

5.(b) Contents

(1) Type and Form of material

Unirradiated fuel rods consisting of uranium dioxide fuel pellets clad in zircaloy or stainless steel tubes. Uranium is enriched to a maximum of 5.0 wt% in the U-235 isotope except for the T15X15 cruciform assemblies, which have a maximum enrichment of 2.8 wt% in the U-235 isotope. The sum of the cladding wall thickness and the pellet-clad radial gap must not be less than 0.023 inch, except for the T15X15 square array fuel assemblies. For the T15X15 square array fuel assemblies the sum of these two parameters must not be less than 0.016 inch. The maximum length of the active fuel region is 196 inches, except for the T15X15 cruciform assemblies, whose maximum active fuel region is 116 inches. Fuel rods must be in one of the following configurations:

(i) Fuel assemblies consisting of a maximum of 204 fuel rods in a 15 x 15 square array with a maximum nominal fuel rod pitch of 0.563 inch and a maximum assembly cross section of 8.445 inches square. The fuel rod cladding must have an OD not less than 0.410 inch and not greater than 0.430 inch. The fuel rod arrangement is as shown in Figure 11.1 of the application.

(ii) Fuel assemblies consisting of a maximum of 264 fuel rods in a 17 x 17 square array (with any number of edge rods missing) with a maximum nominal fuel rod pitch of 0.496 inch and a maximum assembly cross section of 8.432 inches square. The fuel rod cladding must have an OD not less than 0.355 inch and not greater than 0.380 inch. The fuel rod arrangement is as shown in Figure 11.2 of the application.

(iii) Fuel assemblies consisting of any number of fuel rods in a square array with maximum assembly cross section of 8.25 inches square. The fuel rod cladding must have an OD not less than 0.260 inch and not greater than 0.500 inch.

(iv) Any number of fuel rods positioned in a rod container. The rod container consists of a schedule 40 steel pipe with a maximum nominal diameter of 5 inches. The fuel rod cladding must have an OD not less than 0.260 inch and not greater than 0.500 inch.

(v) Fuel assemblies consisting of a maximum of 208 fuel rods in a 15 x 15 square array (with any number of edge rods missing) with a maximum nominal fuel rod pitch of 0.527 inch and a maximum assembly cross section of 7.91 inches square. The fuel rod cladding must have an OD not less than 0.364 inch and not greater than 0.400 inch. The fuel rod arrangement is as shown in Figure VII-1 of the application.

(vi) Fuel assemblies consisting of a maximum of 28 fuel rods in a cruciform array with a maximum nominal fuel rod pitch of 0.556 inch and a maximum assembly cross section of 8.25 inches square. The fuel rod cladding must have an OD not less than 0.260 inch and not greater than 0.500 inch. The fuel rod arrangement is as shown in Figure VII-3 of the application.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package

Total weight of fuel assemblies, or fuel rods and rod containers, not to exceed 3400 pounds, and

(i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(v) and 5(b)(1)(vi):

Two full length fuel assemblies. Two short fuel assemblies may be substituted for each full length fuel assembly provided the two short assemblies are shipped end-to-end and the total fuel length does not exceed the maximum fuel length for a full length assembly.

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

Two rod containers.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

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 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.

7. Hydrogenous shims are not permitted within the fuel assemblies.

8. Separator blocks, shock mounts, and fuel element clamp assemblies must be in accordance with Tables 2.2, 2.3, 2.4, 2.5, and VII-3 of the application.

9. Each separator block must be attached to the strongback by one of the following methods, as shown in Drawing No. EMF-309,813, Rev. 2, Sheet 2:

(a) Two, 5/8-11 UNC Grade 5 steel cap screws and nuts. A 5/8-11 UNC Grade 2 (or better) steel stud may be substituted for one of the cap screws.

(b) Two, 1-8 UNC Grade 8 steel cap screws and nuts. A 1-8 UNC Grade 8 steel stud may be substituted for one of the cap screws.

10. The fuel assembly cross section is defined as the rod pitch times the number of rods on the edge of the assembly.

11. Rods containing gadolinia or other neutron poison are authorized but not required.

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

    (a) The package shall be prepared for shipment and operated in accordance with the procedures in Chapter 3.0 of the application, and supplemental operating procedures dated July 1, 1997.

    (b) Each packaging shall be maintained in accordance with the procedures in Section 3.4 of the application.

    (c) Each packaging shall meet the acceptance tests in Chapter 4.0 of the application.

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, 2004.

REFERENCES

Advanced Nuclear Fuels Corporation application dated October 15, 1990.

Siemens Nuclear Power Corporation supplements dated September 18, 1991; April 22, 1992; January 25, 1994; July 1, 1997; March 16, 18, 21, and 24, 1998; April 28, May 6, August 31 and October 6 and 12,1999; and July 7, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 20, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6613	8	USA/6613/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Amersham Corporation
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Amersham Corporation application dated November 27, 1991, as supplemented.

c. DOCKET NUMBER 71-6613

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 410 pounds.

(3) Drawings

The cask and other system components are constructed in accordance with Technical Operations, Inc. Drawing Nos.: 70290, Sheet 1 to 4, Rev. D.

(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 (output).

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

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

(a) Each package shall be operated and prepared for shipment in accordance with Section 7.0 of the application, as supplemented.

(b) The package must meet the Acceptance Tests and Maintenance Program, Section 8.0 of the application, as supplemented.

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, 2003.

REFERENCES

Amersham Corporation application dated November 27, 1991.

Supplements dated: April 20, December 1, 1992; March 19 and 26, 1993; March 1, 1996; and January 9, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 2, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6642	6	USA/6642/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

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, as supplemented.

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 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 equally spaced lifting lugs are provided around the upper hemisphere. The cask gross weight is approximately 9,500 pounds.

(3) Drawings

The SRL 4.5-Ton Californium shipping cask is as described, and is constructed in accordance with E.I. 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment and operated in accordance with the Operating Procedure described in the application, as supplemented dated September 18, 1991.

(b) The package must be maintained in accordance with the Maintenance Program described in the application, as supplemented dated September 18, 1991.

8. Use of packaging fabricated after August 31, 1986, is not authorized.

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, 2002.

REFERENCES

Safety Analysis Report - Packages SRL 4.5-Ton Californium Shipping Cask, DPSPU 74-124-6, December 1974, Revision 1, March 1976.

Supplements dated: September 18, 1991; and July 17, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: 02/04/97

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6717	10	USA\6717\B(U)	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Amersham Corporation application dated October 10, 1990, as supplemented.

c. DOCKET NUMBER 71-6717

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.: 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 (approximately 14 inches in diameter and 17 inches in height) 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, and 1 inch on the 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 100 pounds.

The maximum gross weight of the secondary packaging (device and molded polyurethane filler) not to exceed:

i) 65 pounds for the Model Nos.: Century, Century S, Century SA, Century S Universal, Century SA Universal, C-10, 35, 35S and 35SA;

ii) 60 pounds for the Model Nos.: 20V, 40V, 20VS, 40VS and U-110;

iii) 45 pounds for the Model Nos. Pipeliner Model 1, Pipeliner Model 201 and Mariner; and

iv 54.5 pounds for the Model No. MX-IC-100.

(3) Drawings

The overpack must be constructed in accordance with Amersham Corp. Drawing Nos. 93590, Rev. C; 93690, Rev. C; 93790, Rev. D; 93890, Rev. B; and 93990, Rev. C.

(a) Packaging (continued)

(3) Drawings (continued)

The radiographic devices, as secondary packaging, authorized for use in the overpack are constructed in accordance with the following Drawing Nos.:

For the Model No. Century: Gamma Industries Drawing Nos. 821-1001-101, Rev.- dated 7/2/76; and 821-1001-005, Rev. 4;

For the Model Nos. Century S and Century SA: Gamma Industries Drawing Nos. 821-1001-439A, Rev. A; 821-1001-101, Rev. - dated 7/2/76; and 821-1001-005, Rev. 4;

For the Model Nos. Century S Universal and Century SA Universal: Gamma Industries Drawing No. 821-1001-441A, Rev. - dated 2/15/82; and 821-1001-101 Rev. - dated 7/2/76;

For the Model No. C-10: Gamma Industries Drawing Nos. 821-1005-018 Rev.- dated 9/27/93; and 821-1001-101, Rev. - dated 7/2/76;

For the Model Nos. 35 and 35S: Gamma Industries Drawing Nos. 821-1001-105, Rev.- dated 9/15/70; and 821-1001-002, Rev. 2C;

For the Model No. 35SA: Gamma Industries Drawing Nos. 821-1001-105, Rev. - dated 9/15/70; and 821-1001-003, Rev. 2C;

For the Model Nos. 20V and 40V: Gulf Nuclear, Inc., Drawing Nos. 1000-51-03, Rev. - dated 12/14/83; A-31, Sheets 3 & 4, Rev. 1; A-31-21 Sheets 1, 2 and 3, Rev. 1; and A-31-34 Sheet 1 and 2 of 4, Rev. 1.

For the Model Nos. 20VS and 40VS: Gulf Nuclear, Inc. Drawing Nos. A-31 Sheets 3 and 4, Rev. 1; A-31-1 Sheet 1, Rev. 1 and Sheet 2, Rev. - dated 1/15/83; A-31-12, Rev. - dated 1/4/84; A-31-16, Rev. 2; 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 2; A-31-32, Rev.2; A-31-34 Sheet 1, Rev. 1 and Sheet 2, Rev. - dated 1/11/84; 1000-50-14, Rev. -; and 1000-50-13, Rev. 2;

For the Model No. U-110: Amersham Corp. Drawing No. 93691, Rev. - dated 10/9/90; 93692, Rev. A; and Gulf Nuclear, Inc., Drawing No. A-31-21 Sheets 1, 2 and 3, Rev. 1,

For the Model No. Pipeliner Model 1: Amersham Corp. Drawing No. 93591, Rev. A; SK 2473, Rev. - dated 4/1/88; and SK 2473-1, Rev. - dated 1/21/88; and Gamma Industries Drawing No. 811-1001-287, Rev. 1;

For the Model No. Pipeliner Model 201: Gamma Industries Drawing Nos. 821-1001-019B, Rev. 5; and Drawing No. 821-1001-235, Rev. 5;

For the Model No. Mariner: Gamma Industries Drawing Nos. 821-1001-024, Rev. 1; and 821-1001-351, Rev. 1; and

For the Model No. Magnaflux Model MX-IC-100: Magnaflux Corp. Drawing No. C-211626, Rev. - dated 2/9/78.

(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.

(i) 35 Curies contained in the Model Nos. 35, 35S or 35SA.

(ii) 100 Curies contained in the Model No. MX-IC-100.

(iii) 120 Curies contained in the Model Nos. Century, Century S, Century SA, Century S Universal, Century SA Universal, Pipeliner Model 1, 20V, 20VS or U-110.

(iv) 220 Curies contained in the Model Nos. 40V or 40VS.

(v) 240 Curies contained in the Model Nos. C-10, Pipeliner Model 201 or Mariner.

6. 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.

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

(a) The package must be prepared for shipment and operated in accordance with the operating procedures in Chapter 7 of the application, as supplemented.

(b) The drum should be assembled without a gasket and with the clamping ring tightened until the maximum gap between the lug nuts is 3/16-inch.

(c) The package must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

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: November 30, 2003.

REFERENCES

Amersham Corporation application dated October 10, 1990.

Amersham Corporation supplements dated: December 3, 1990; March 12, April 1, July 18, October 25, and December 20, 1991; May 14, July 2, and September 21 and 27, 1993; and May 20, 1994.

AEA Technology/QSA Inc. supplement dated September 1, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 5, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6786	6	USA/6786/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of the Navy
Naval Sea Systems Command
Detachment
Radiological Affairs Support Office
PO Drawer 0260
NWS Yorktown, VA 23691-0260

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, Rev. A.

(3) Drawings

The package is constructed in accordance with the following Aerojet Company Drawing Nos.:

1138441	8-Watt URIPS-8A Assembly
1138442, Rev. C	Generator Housing
1138457	Cooling Fins
1139240, Rev. A	Fin Guard
1139245, Rev. A	Shipping Package URIPS-8
1139246	8-Watt URIPS Assembly
1138459, Rev. A	Shipping Frame-URIPS-8
1138443, Rev. B	Top Cover
1138444	Bottom Cover
1138436	Fuel Capsule
1138437, Rev. B	Shield Uranium
1138435	Fuel Liner
1138440, Rev. A	W-2 Shield Plug
1138453	Insulation
1138455, Rev. B	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. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment and operated in accordance with the operating procedures specified in the supplements dated April 16 and August 6, 1998.

(b) The package must be maintained in accordance with the maintenance procedures specified in the supplements dated April 16 and August 6, 1998.

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, 2003.

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.

Department of the Navy application dated: June 8, 1990.

Supplements: Department of the Navy letter 5104 Ser 455/1U599998 dated June 18, 1991; Department of the Navy letter 5104 Ser N455C/8U595525 dated April 16, 1998; and Department of the Navy letter 5104 Ser N455C/8U595912 dated August 6, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: _____

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9001	33	USA/9001/B( )F	1	6

PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

VECTRA Technologies, Inc., application dated March 30, 1995, 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, 84 inches in diameter, and a maximum of 210-inches long with maximum cavity dimensions of 37-1/2 inches in diameter by 184-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 (350 gallons) of a water and borated water mixture.

Two closure heads are provided for the shipment of BWR and PWR fuel assemblies. The heads are 304 stainless steel forgings and solid 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 stainless steel globe valves and valved quick-disconnect couplings. Stainless steel pipe caps may be used in lieu of the quick-disconnect couplings. The vent line is also equipped with a 350-400 psig rated rupture disk. All valves are housed in protected boxes on the cask exterior.

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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 stainless steel globe valves may be replaced by stainless steel blind flanges. 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 three types of fuel baskets which can be interchanged to accommodate various fuels. The PWR basket holds seven assemblies, the unchanneled BWR basket holds eighteen assemblies, and the channeled BWR basket holds seventeen assemblies. The channeled and unchanneled BWR fuel baskets 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 ductwork. 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 hinged panels on the side and a hinged door on 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 45,000 pounds.

(3) Drawings

The Model No. IF-300 shipping cask is described by the following General Electric Company Drawing Nos.: 159C5238 - Sheet 1, Rev. 9; Sheet 2, Rev. 3; Sheet 3, Rev. 9; Sheet 4, Rev. 8; Sheet 5, Rev. 5; Sheet 6, Rev. 8; Sheet 7, Rev. 4; Sheet 8, Rev. 5; Sheet 9, Rev. 8; Sheet 10, Rev. 5; and Sheet 11, Rev. 2, and Pacific Nuclear Systems, Inc. Drawing Nos.: 420-11-3000, Sheets 1 through 9, Rev. 1; 420-11-3001, Sheet 1, Rev. 1; 420-11-3002, Sheets 1 and 2, Rev. 1; 420-11-3003, Sheets 1 and 2, Rev. 1; 420-11-3004, Sheets 1 and 2, Rev. 1; 420-11-3005, Sheets 1 and 2, Rev. 1; and 420-11-3006, Sheet 1, Rev 1.

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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 Section IX, Table IX-1.

(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 <u>not</u> 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

	PWR	BWR
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	[illegible]	198
Maximum initial U-235 enrichment, weight percent	4.0	4.0
Maximum bundle cross section, in	[illegible]	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

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5.(b) Contents (continued)

Group II fuel assemblies

	PWR	BWR
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, weight percent	4.0	4.0
Maximum bundle cross section, in²	8.75	5.75
Fuel pin array	16x16, 17x17	8x8
Fuel diameter, in	0.3[illegible]2400	0.475-0.505
Fuel pin pitch range, in	[illegible].507	0.630-0.645
Maximum active fuel length, in	[illegible]	150

(ii) Solid irradiated hardware, which may include fissile material, provided the quantity of fissile material does not exceed a Type A quantity and does not exceed the mass limits of 10 CFR 71.53. 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 PWR fuel assemblies, seventeen channeled BWR assemblies, or eighteen unchanneled 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. 8, or PNSI Drawing No. 420-111-3000, Sheets 1 through 9, Rev. 1.

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) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The end of life total calculated residual gas that could become available from the fuel pins must not exceed 0.50 lb moles for content 5.(b).

7. The maximum gross weight of the cavity contents must not exceed 21,000 pounds.

8. 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 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.

9. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized for use in the package.

10. Group I fuel assemblies which are 15x15 PWR fuel assemblies and have a maximum initial U content of 439 kilograms per assembly and a minimum cooling time of 60 months may have a maximum assembly burnup of 45,000 MWD/MTU.

11. Prior to each shipment, the licensee must confirm that the cask contains no more than 1 cubic foot of water in the cavity and the licensee must prepare the cask for shipment, in accordance with Subsection 10.1 of the application.

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 six feet from the side of the cask (ten 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. Replacement globe valves other than the valve specified on Drawing No. 159C5238-Sheet 4, Rev. 8, must be tested as stated in Subsection 6.6.3.2 of the application.

15. The packaging must be maintained in accordance with the requirements of Subsection 10.2 of the application. 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.

16. The cask cavity must be equipped with 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 unchanneled BWR basket must be coated with a minimum of ½-mil of copper.

18. A shutoff valve must not be installed between each neutron shield tank and its respective thermal expansion tank.

19. The cask may be wrapped with reinforced plastic during shipment, provided that the decay heat of the contents does not exceed 1.5 KW. The reinforced plastic used to wrap the cask must not be greater than 0.015 inches thick or have a thermal conductivity less than 0.0242 Btu/hr-ft-°F. The reinforced plastic wrapping cannot be used as the cask surface for purposes of complying with 10 CFR 71.87.

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

21. Expiration date: September 30, 2005.

REFERENCES

VECTRA Technologies, Inc., application dated March 30, 1995.

VECTRA Technologies, Inc., supplements dated: April 27, and August 18, 1995; November 25, 1997;

.iem-Nuclear Systems supplements dated January 9, 1998, and July 14, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date August 28, 2000

PRINTED ON RECYCLED PAPER

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9009	18	USA/9009/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Nuclear Fuel Services
P.O. Box 337, MS 123
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application
dated January 27, 1984, as supplemented.

c. DOCKET NUMBER 71-9009

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 a 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 ½-inch thick welded bottom plate and a 304L stainless steel 300 pound slip-on 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-ring 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.

(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 the U-233 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 the U-233 content is not greater than 20% of the combined U-233 and U-235 content; or

(iii) Uranyl sulfate solution (UO_2SO_4) containing uranium-235; or

(iv) Dry compounds and mixtures of uranium-235; or

(v) Uranium oxide interspersed with graphite or silicon carbide plus plastic packing material; or

(vi) Uranyl nitrate solutions enriched in the U-235 isotope having a U-235 concentration not to exceed 350 grams per liter.

(2) Maximum quantity of material per package

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

Not to exceed 3.675 kilograms fissile material, 21 watts decay heat, and 10.5 liters of solution.

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

Not to exceed 950 grams fissile material and 18 watts decay heat.

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

Not to exceed 4.5 kilograms fissile material and 30 watts decay heat.

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

Not to exceed 300 grams fissile material and 10 watts decay heat.

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

Not to exceed 10.0 liters of solution.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The solution contents of the package shall be contained within a bottle having one of the following specifications:

   (a) For contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii):

      (i) Slit-vent polyethylene bottle per Drawing No. CAPE-1170-37,

      (ii) Duo-vent polyethylene bottle 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.

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

      Slit-vent or duo-vent polyethylene bottle per Nuclear Fuel Services, Inc., Specification U-1, Rev. 2, and Drawing No. 5B-U-740, Rev. 2.

7. For shipment of solutions, the shipment must be completed no later than 365 days after the stainless steel or polyethylene bottle is closed. After filling with solution, the minimum remaining free volume within the stainless steel or polyethylene bottle must be at least 0.44 liters.

8. 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.

9. 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.

10. 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.

11. 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.

12. Prior to each shipment of more than a Type A quantity of radioactive material, the space between the double O-ring 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.

13. 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 contents of not more than a Type A quantity of radioactive material, this test shall not be required.

14. 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.

15. Prior to release of the package for shipment, a radiation survey should be performed, including a determination of surface contamination, to assure compliance with 10 CFR §§71.47 and 71.87.

16. In addition to the conditions in this certificate, each packaging must meet the Acceptance Test Section 8.0 of the current Safety Analysis Report of January 27, 1984, as revised April 26 and May 16, 1984.

17. In addition to the conditions in this certificate, the packaging shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the current Safety Analysis Report of January 27, 1984, as revised April 26 and May 16, 1984.

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

19. Expiration date: September 30, 2004.

REFERENCES

General Electric Company application dated January 27, 1984.

Supplements dated: April 26 and May 16, 1984; and February 8 and June 7, 1994.

Westinghouse Electric Corporation supplement dated: May 15, 1984.

Nuclear Fuel Services, Inc. supplements dated: July 3 and October 23, 1996, November 6, 1997, and May 28, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges
for

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

Date: September 20, 1999

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
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9010	39	USA/9010/B( )F	1	9

2. PREAMBLE

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

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

a. ISSUED TO *(Name and Address)*

NAC International, Inc.
655 Engineering Drive, Suite 200
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation application dated February 27, 1996.

c. DOCKET NUMBER 71-9010

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 its bottom end to a circular plate.

There are four 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 silver plated, metallic O-ring. Eight of the twelve closure bolts 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.

5.(a) Packaging (continued)

(2) Description (continued)

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.

Configuration (C): Same as Configuration (B), above, except the radioactive contents are positioned and supported within the containment vessel (inner cask cavity) in a stainless steel structure containing Boral sheets positioned so as to provide necessary neutron absorption.

Configuration (D): Same as Configuration (B) above, except that the radioactive contents are positioned and supported within the containment vessel (inner cask cavity) in a 3-element stainless steel structure as shown in NAC Drawing No. 347-291-F12, sheet 1, Rev. 2, and the cask must be enclosed in a closed shipping container.

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 3,000 pounds. The weight of the package is approximately 49,250 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. 8, 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. 11, Inner Container
70562F, Sheet 2, Rev. 7, Inner Container
70562F, Sheet 3, Rev. 0, Inner Container*
70562F, Sheet 4, Rev. 0, Inner Container*

5.(a) Packaging (continued)

(3) Drawings (continued)

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

Configuration (C)

70888F, Sheet 1, Rev. 3, Spent Fuel Cask General Assembly
460-052-F8, Sheet 1, Rev. 4, Rockwell Fuel Basket-NLI-1/2 Cask*
460-052-F9, Sheet 1, Rev. 3, Container - Fermi Fuel, Rockwell Basket, NLI-1/2 Cask, Assembly of*

Configuration (D)

70888F, Sheet 1, Rev. 3, Spent Fuel Cask General Assembly
347-291-F12, sheet 1, Rev. 2, Liner - 3 Element, NLI-1/2 Cask, Fuel Movement Project*

*Nuclear Assurance Corporation drawings.

(b) Contents

(1) Type and form of material

(i) Irradiated PWR or BWR uranium oxide fuel assemblies of the following specifications:

	PWR	BWR	Consolidated Fuel Rods
Fuel form	Clad UO_2 pellet	Clad UO_2 pellet	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS	Zr or SS
Maximum initial fuel pin pressure at 100°F, psig	550	200	550
Maximum initial U content/assembly, kg	475	197	950
Maximum average initial U-235 enrichment, w/o	3.70	2.65	3.70
Maximum bundle cross section, inches	8.75	5.75	8.75
Fuel pin array size	14x14/15x15 16x16/17x17	7x7 8x8	Pins from 7x7, 8x8, 14x14, 15x15, 16x16, 17x17 in triangular pitch

5.(b)(1)(i) (continued)

	PWR	BWR	Consolidated Fuel Rods
Maximum active fuel length, inches	144	145.25	144
Maximum specific power, kW/kgU	40	27	40
Maximum average burnup, MWD/MTU	40,000**	34,000	40,000
Maximum decay heat, kW	10.6	10.6	0.6
Minimum cooling time, days	150*	120	4,380

The PWR type assembly may be shipped either with or without burnable poison rods or control rods.

*Four (4) fuel rods may have a 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.)

(ii) Irradiated metallic fuels of the following specifications:

	Fermi-1	EBR-II Blanket
Fuel form	Uranium-molybdenum alloy pins	Uranium metal cylindrical slugs
Cladding material	Zr	Aluminum containers
Max. initial U content/assembly, kg	18.7/assy. 300/16 assy. cask load	292/container
Max. avg. initial U-235 enrichment, w/o	26.0	0.21 (3.88 kg Pu/canister)
Max. bundle cross section, inches	2.93 sq	4.875 dia
Fuel rods per canister	140	41
Max. active fuel length, inches	30.5/assy 122/cask	157
Max. average burnup, MWD/MTU	2,840	2,400
Max. decay heat, watts	20	300
Min. cooling time, days	5,000	365

(iii)

	Research Reactor
Fuel form	Uranium metal rods
Cladding material	Aluminum
Maximum initial U content/assembly-kg	54.5
Maximum average initial U-235 enrichment	Natural
Maximum bundle cross-section inches	1.36
Intact fuel rods per canister, maximum	7
Canisters per cask	3 intact fuel
Max. active fuel length, inches	120.5
Maximum average burnup MWD/MTU	1,600
Maximum decay heat, watts	750
Minimum cooling time, days	365

(iv) Irradiated PWR* or BWR uranium oxide fuel rods of the following specifications:

	PWR Rods	BWR Rods
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, kg	58.2	75
Maximum average initial U-235 enrichment, w/o	4.9	5.0
Maximum bundle cross section, inches	8.75	5.75
Maximum active fuel length, inches	150	150
Maximum specific power, kW/kgU	44	60

(iv) (continued)

	PWR Rods	BWR Rods
Maximum average burnup, MWD/MTU	60,000	75,000
Maximum decay heat, kW	1.65	4.0
Minimum cooling time, days	150	150

* For the shipments of irradiated PWR fuel rods, the neutron shield fluid must contain 1.0 weight percent boron (the borated fluid may be left in the shielding tanks during the shipment of other contents).

(v) Solid, non-fissile, irradiated hardware and neutron source components.

(vi) Byproduct and special nuclear material in the form of irradiated uranium and plutonium oxide fuel rods. Prior to irradiation, the maximum average enrichment in U-235 plus plutonium not to exceed 3.70 w/o and the maximum enrichment not to exceed 4.0 w/o.

(vii) Irradiated PWR uranium oxide fuel assemblies including additional irradiated fuel rods inserted and secured in the guide thimbles. The fuel assemblies must conform to the maximum active dimensions as described in Item 5(b)(i) except that maximum initial U content must be 495 kg and the maximum average initial U-235 enrichment shall be 3.35 w/o.

(viii) Irradiated Connecticut Yankee fuel assembly with a maximum average initial U-235 enrichment of 4.0 w/o and each of the 15 x 15 fuel rods clad by stainless steel. 204 rods/assembly; active length of 121.4 inches.

(ix) Irradiated MARK 42 fuel assemblies consisting of three concentric fuel tubes with PuO_2-Al powder metallurgy cores clad with type 6063 aluminum, containing a total of 3.35 kg of plutonium. The plutonium was initially enriched to contain 78.28 w/o Pu-239, 2.27 w/o Pu-241 and 0.15 w/o Pu-238.

(x) Irradiated MARK 22 fuel assemblies consisting of two concentric fuel tubes with uranium-aluminum cores clad with type 8001 aluminum, containing a total of 3.2 kg of uranium-235. The uranium was initially enriched to contain 66 w/o to 80 w/o uranium-235. The irradiated MARK 22 fuel assembly has an active length of 150 inches, a maximum burn-up of 1226 MWD and a minimum cooling time of 150 days.

(2) Maximum quantity of material per package

(i) Items 5(b)(1)(i) or 5(b)(1)(vii) above: one PWR fuel assembly; two BWR fuel assemblies; or one consolidated fuel canister. Fuel assemblies to be contained in their respective fuel baskets as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 11, or 70886F, Sheet 1, Rev. 2. The consolidated fuel canister to be contained in Configuration (A) fuel basket as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 11.

(ii) Item 5(b)(1)(ii) above: four canisters per cask. The fuel canisters and fuel basket must be in accordance with Configuration (C) above.

5.(b)(2) (continued)

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

(a) three canisters of unfailed fuel containing up to seven fuel rods per canister. The fuel canisters and fuel basket must be in accordance with Configuration (D) above; or

(b) up to six canisters containing one defective fuel rod per canister. The canisters are 2.75-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D2, Rev. 10, and are placed in the six-rod capacity liner as shown on Nuclear Assurance Corporation Drawing No. 347-029-20, Rev. 1. The maximum decay heat load for a defective fuel rod is limited to 5 watts; or

(c) up to three canisters containing either one defective fuel rod per canister or up to 10 failed fuel filters per canister. The canisters are 4.00-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D1, Rev. 10. The fuel basket is in accordance with Configuration (D) above. The weight of the filters is limited to 125 pounds per canister. The maximum decay heat load for the defective fuel rods and the failed fuel filters is limited to 5 watts per canister. Plutonium content of the filters not to exceed 20 curies plutonium per package.

(iv) Item 5(b)(1)(iv) above, the fuel rods will be shipped in Configuration (A) or (B). PWR fuel rods with burnup in excess of 45,000 MWD/MTU and BWR fuel rods with burnup in excess of 50,000 MWD/MTU will be shipped in Configuration (A) only. The maximum initial uranium content is limited to 58.2 kg per package for PWR rods and 75 kg per package for BWR rods; and

(a) up to 25 PWR fuel rods or up to 25 BWR fuel rods per cask. Up to 2 of the 25 PWR rods may have a maximum burnup of 65,000 MWD/MTU; or

(b) up to 18 PWR fuel rods, with a maximum specific power of 60 kW/kgU and a minimum cooling time of 300 days, per cask.

(v) Item 5(b)(1)(v) above, weight not to exceed 1,600 pounds.

(vi) Item 5(b)(1)(vi) above, the maximum mass of U-235 plus plutonium must not exceed 4.0 kg. Fuel rods must be contained in fuel baskets as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 11, or 70886F, Sheet 1, Rev. 2.

(vii) Item 5(b)(1)(viii) above: One Connecticut Yankee intact irradiated fuel assembly.

(viii) Item 5(b)(1)(ix) above: One irradiated MARK 42 fuel assembly in either intact or sectioned form, using Configuration (C) above. If sectioned, each section must be seal welded in a shipping can as shown on Martin Marietta Energy Systems Drawing Nos. M-12821-CP-105E, Rev. 0, and M-12821-CP-106E, Rev. 1. Four shipping cans will be loaded into a MARK 42 Segment Dry Shipping Canister as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-102, Rev. 1, along with a shipping canister spacer, as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-103, Rev. 1. The shipping canister will be loaded

(5)(b)(2) (continued)

on top of a carrier spacer as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-112, Rev. 0. A maximum of 2 shipping canisters may be loaded into a cask. Intact fuel assemblies will be shipped in a MARK 42 Element Wet Shipping Canister as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-114, Rev. 0. A maximum of one intact assembly may be loaded into a cask.

(ix) Item 5(b)(1)(x) above: Two MARK 22 fuel assemblies or one MARK 22 fuel assembly with the two cores separated, using Configuration (C) above. Each assembly or core will be shipped in a shipping canister as shown on Sandia National Laboratory Drawing No. R21563, Sheet 1, Iss. B.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Irradiated fuels described in items 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), and 5(b)(1)(iv) above may not have a maximum burnup which exceeds 1.25 times the specified maximum average burnup.

7. 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 the residual moisture from cask cavity when package is used in Configurations (B), (C), or (D) is not required providing the decay heat load does not exceed 2.0 kW.

8. For the shipment of irradiated fuel assemblies or a canister of consolidated irradiated fuel, the cask cavity canister of consolidated irradiated fuel (if present), 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 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.

9. 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).

10. The consolidated fuel canister must be provided with vent and drain lines (openings) to permit free draining of the canister. No valves can be installed on the vent and drain lines.

11. The cask may be shipped in a closed shipping container (Configuration D) provided that the closed shipping container and the transport vehicle (trailer) meet the applicable requirements of the Department of Transportation. Tie-down devices which are a structural part of the cask and the cask support structures must comply with 10 CFR 71.45.

12. When the cask is shipped in a closed shipping container the center of gravity of the combined cask, closed shipping container and trailer must not exceed 75.0 inches.

13. When the cask is shipped in a closed shipping container, the internal heat load must not exceed 750 watts.

14. 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. The neutron shield tank may be empty when the cask is in Configuration D.

15. The structures used to support the package on the transport vehicle must be as described in the application.

16. 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).

17. As needed, appropriate component spacers must be used in the cask cavity to limit movement of contents during shipment.

18. Shipping cans used for sectioned MARK 42 irradiated fuel assemblies must be seal welded and must be leak tested to 1×10^{-7} std cm^3/sec.

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

    (a) The package shall be prepared for shipment and operated in accordance with the operating procedures in Section XV of the application, as supplemented.

    (b) The package shall be maintained and tested in accordance with the maintenance program in Section XVI of the application, as supplemented.

    (c) When the package is to be used for the transport of authorized contents having a decay heat load of greater than 4.0 kW, a 220 psig hydrostatic test of the containment cavity, and a 405 psig hydrostatic test of the water jacket and expansion tank shall be performed as part of the maintenance program as specified in Section XVI of the application.

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

21. Effective Date: April 1, 1996. Expiration date: April 30, 2001.

REFERENCES

Nuclear Assurance Corporation application dated February 27, 1996, as supplemented March 26, 1996; June 9, 1998; March 29 and May 20, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach

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

Date 5/25/99

NRC FORM 618
(3-96)
10 CFR 71

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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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Transnuclear, Inc.
Two Skyline Drive
Hawthorne, NY 10532-2120

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Transnuclear, Inc., application dated March 25, 1991, 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.

5.

(a) Packaging

(1) Model No.: TN-8 AND TN-8L

(2) Description

The TN-8 and TN-8L are lead, steel and resin-shielded irradiated fuel shipping casks. The casks approximates a right circular cylinder 1,718 mm in diameter and 5,516 mm long. The cavity consists of three 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, 26 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, 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, 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.

The lid of the cask may be replaced with a modified lid which increases the cavity length to 4,362 mm or to 4,394 mm with the lid plate removed. This arrangement will be referred to as "Configuration X."

Trunnions are used for lifting and tie-down of the package. The package weighs 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 Annexes A, B, and C to Chapter II of the application.

The lid for Configuration X is constructed in accordance with Transnuclear Drawing Nos. 9040-500-1, Rev. 1, 9040-500-2, Rev. 1 and 9040-500-3, Rev. 0.

(b) Contents

(1) Type and form of material

(i) 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 with Zr cladding, w/o	3.2
Maximum average initial U-235 enrichment with SS cladding, w/o	4.0
Maximum bundle cross section, in	8.5
Maximum active fuel length, in	146
Minimum cooling time, day	150
Maximum weight/fuel assembly, kg	733; and
Group I fuel assemblies	
Initial fuel pin pressure at 100°F, psig	250
Maximum average burnup, MWD/MTU	38,500; or
Group II fuel assemblies	
Maximum average burnup, MWD/MTU	36,000

For the casks in Configuration X, the minimum cooling time of the fuel assemblies shall be 1,460 days with the lid plate installed and 2,190 days with the lid plate removed.

(ii) 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.

(iii) Intact BWR and PWR fuel rods. The rods shall be constrained by a basket or grid structure; initial U-235 content shall be less than 15.0 kg per rod bundle; cross sectional area of the rods, tubes, and full length structural material shall not be less than 29.6 square inches; and the bundle cross section shall not be greater than 8.5 inches. Maximum weight per bundle shall not exceed 733 kg. The Group I and Group II burnup limits of paragraph 5.(b)(1)(i) apply.

(2) Maximum quantity of material per package

(i) For the contents described in Item 5.(b)(1)(i), Group I fuel assemblies:

Three 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)(i), Group II fuel assemblies:

Three 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 Shipment, kw[a]	Maximum Free Gas for 3 Assemblies m^3 (NTP)[b]	Configuration X Maximum Free Gas for 3 Assemblies m^3 (NTP)[b]
1.5	0.558	0.601
3.0	0.543	0.585
9.0	0.483	0.520
15.0	0.441	0.475
21.0	0.408	0.439
27.0	0.384	0.413

Notes:
(a) Decay heat load per assembly must not exceed 7.9 kilowatts for Model No. TN-8L packaging.

(b) NTP conditions are 25°C and one (1) bar.

5.(b)(2) (Continued)

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

Three rod bundles. The maximum decay heat load and maximum free gas volume are not to exceed the limits listed in Paragraph 5.(b)(2)(ii).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Group I and Group II fuel assemblies, either Zr or SS clad, and bundles of PWR and/or BWR fuel rods that individually meet all the appropriate specifications of 5.(b)(1)(i), 5.(b)(2)(i), 5.(b)(1)(iii), and 5.(b)(2)(iii) above may be packaged in any combination.

7. PWR assemblies may be shipped either with or without burnable poison rod, thimble plug, or control rod assemblies.

8. As needed, appropriate component spacers may be used in the cask cavity to properly position the fuel assemblies.

9. The maximum weight of the contents (fuel assemblies, component spacers, inserts, irradiated hardware, etc.) must not exceed 2,200 kg.

10. 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. For contents 5.(b)(1)(i) and 5.(b)(1)(iii), the cavity must be promptly backfilled with 1.0 atm of helium, nitrogen, or argon gas.

11. Known or suspected failed fuel assemblies (rods) and fuel cladding defects greater than pin holes and hairline cracks are not authorized.

12. For contents 5.(b)(1)(ii), the dryness verification test is required but leakage tests for containment assembly verification are not required.

13. 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.

14. 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.

15. The systems and components of each packaging must meet the periodic tests and criteria specified in Chapter VIII of the application. The K_{eff} verification and shielding efficiency verification tests in Chapter VIII of the application must be performed on each packaging within the two year period preceding any shipment of contents listed in 5(b)(1)(i) and 5(b)(1)(iii). The K_{eff} verification and shielding efficiency verification tests need not be performed on packaging during periods (which may exceed two years) when only irradiated hardware as specified in 5(b)(1)(ii) is shipped.

16. In addition to the requirements of 10 CFR Part 71:

    (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in the application dated March 25, 1991.

    (b) Each package must be tested, repaired, and maintained in accordance with the Acceptance Tests and Maintenance Procedures in the application dated March 25, 1991.

17. 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.

18. In accordance with Annex L to Chapter VIII, at periodic intervals not to exceed two 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.

19. The Configuration X lid shall be operated and maintained in accordance with Annex N to Chapter VIII, in the application dated March 25, 1991.

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

21. Effective date: June 1, 1996. Expiration date: May 31, 2001.

REFERENCES

Transnuclear, Inc., application dated March 25, 1991, and supplements dated April 22, 1991, and April 22, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 14, 1996

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9016	11	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Transnuclear, Inc.
Two Skyline Drive
Hawthorne, NY 10532-2120

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Transnuclear, Inc., application dated March 25, 1991, 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

The TN-9 is a lead, steel and resin shielded irradiated fuel shipping casks. The casks 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, separated by thin copper plates. The bays are divided into a total of seven 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 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 vessels are closed and sealed by sixteen, 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, 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. Trunnions are used for lifting and tie-down of the package. The weight of the package is 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 must be in accordance with Annex A, B, and C to Chapter II of the application.

5.(b) Contents

(1) Type and form of material

(i) Irradiated BWR uranium oxide fuel assemblies of the following specifications:

Fuel form	Clad UO2 Pellets
Cladding material	Zr 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/MTD	36,500
Minimum cooling time, day	150
Maximum weight/fuel assembly, kg	300

(ii) 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.

(2) Maximum quantity of material per package

(i) Seven 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.

(ii) The maximum weight of the contents (fuel assemblies, component spacers, inserts, irradiated hardware, etc.) must not exceed 2,110 kg.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

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. For contents 5.(b)(1)(i), the cavity must be promptly backfilled with 1.0 atm of helium, nitrogen, or argon gas.

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

   (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter VIII of the application.

   (b) Each package must be tested and maintained in accordance with the Acceptance Test and Maintenance Procedures in Chapter VIII of the application.

8. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.

9. For contents 5.(b)(1)(ii), the dryness verification test is required but leakage tests for assembly verification are not required.

10. The package contents must be so limited that under normal conditions of transport, the total dose rates must not exceed 14 mrem/hr at one meter from the surface of the package.

11. 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.

12. 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.

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. In accordance with Annex L to Chapter VIII, at periodic intervals not to exceed two 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 lower heat load.

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* 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.

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

16. Effective date: June 1, 1996 Expiration date: May 31, 2001.

REFERENCES

Transnuclear, Inc., application dated March 25, 1991, and supplements dated April 22, 1991, and April 22, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 14, 1996

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9023	8	USA/9023/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

NAC International, Inc.
655 Engineering Drive
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation, application dated November 18, 1991, 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 204.5 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 0.75-inch stainless steel inner shell and a 2-inch stainless steel outer shell. The outer shell is surrounded by a 0.75-inch stainless steel water jacket shell. The three shells are welded to stainless steel forgings at both ends. Four water expansion tanks are mounted to the railcar and are connected to the water jacket by a flexible metal hose.

The primary containment vessel is comprised of the 0.75-inch inner shell and the inner closure head. It is 179.5 inches long and has a 45-inch inside diameter. The inner closure head is held in place by sixteen 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 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 lid penetrations are sealed with 1.5-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.

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

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:

	PWR	BWR
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.

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

The maximum decay heat load per package not to exceed 70 kilowatts, and:

Ten PWR fuel assemblies or twenty-four BWR fuel assemblies.

Above assemblies must 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

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

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. The cask contents must be so limited under normal conditions of transport that the following measured dose rates be satisfied:

   a) 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

   b) 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.

10. 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).

11. The neutron shielding system must be equipped with two pressure relief valves (one on the cask and one on an expansion tank) set at 220 psig.

12. 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.

13. The systems and components of each packaging must meet the criteria for the periodic tests specified in Section XVII of the application.

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

    (i) Each packaging must meet the acceptance tests and be maintained in accordance with Section XVII of the application, and

    (ii) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Section XVI of the application.

15. 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.

16. Packaging is authorized for rail mode of transport only.

17. Expiration date: July 31, 2003.

REFERENCES

Nuclear Assurance Corporation application dated November 18, 1991.

Supplements dated: February 7, 1992; and February 28 and November 25, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date July 9, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9027	15	USA/9027/B(U)-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

AEA Technology/QSA, Inc. application dated February 15, 1999, 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 No.: 741-OP

(2) Description

The Model No. 741-OP consists of gamma ray projector within a protective carbon steel container. The protective container is of welded steel construction and is approximately 32 inches long, 10 inches wide, and 18.5 inches high. Polyurethane foam and wood inserts locate the Model No. 741 series projectors in the center of the container and provide impact protection.

The 741 series projectors include the Model Nos. 741, 741E, 741A, 741AE, 741B and 741BE. The primary components of the projector consist of an outer steel shell, internal bracing, polyurethane foam, depleted uranium shield, and an "S" tube. The radioactive contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. A 1/4-thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. Tamper-proof seals are provided on the outer steel container. The dimensions of the projector are approximately 19 1/8 inches long, 13 7/8 inches wide, and 9 15/16 inches in height. The maximum weight of the package is 515 pounds and the maximum weight of the projector is 360 pounds.

(3) Drawings

The package is constructed in accordance with AEA Technology/QSA, Inc. Drawing Nos. R74190, Rev. D Sheets 1-5, R741NP Rev. A, R85790 Rev. A Sheets 1-2, R85791, Rev. A Sheets 1-2, R67691 Rev. A, R67692 Rev. A, R97010 Rev. E, Sheets 1-3, R97011, Rev. C and R97012 Rev. D, Sheets 1-2.

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.

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

33 curies of cobalt-60; or
240 curies of iridium-192 (output).

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. The source shall be secured in the shielded position of the packaging by the source assembly lock, lock cap and safety plug assembly. The source assembly lock, lock cap and safety plug assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one half hour and maintaining their positioning function. The locking ball 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7 of the application; and

   (b) The package must meet the Acceptance Test and Maintenance Program of 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: February 28, 2001.

REFERENCES

AEA Technology/QSA, Inc. application dated February 23, 1999.

Supplements dated: April 20, June 7, and September 16 and 21, 1999; and June 9, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 25, 2000

U.S. NUCLEAR REGULATORY COMMISSION

NRC FORM 618
(6-2000)
10 CFR 71

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9030	9	USA/9030/B( )	1	2

PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Department of the Navy
Naval Sea Systems Command
Detachment
Radiological Affairs Support Office
PO Drawer 0260
NWS Yorktown, VA 23691-0260

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Teledyne Energy Systems application dated November 12, 1990, 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 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:

Model No.	Dimension (inch)	Weight (lb)
MW-3000	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.:

Model No.	Drawing Nos.
MW-3000	Martin Co. Drawing No. 471A1000000
Sentinel-8	Isotopes, Inc. Drawing No. J-30856-003-10000

(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.

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(2) The maximum quantity of material per package

Model No.	Quantity
MW-3000	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 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. Fabrication of additional units is not authorized.

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

   (a) The package shall be prepared for shipment and operated in accordance with the operating procedures in the supplement dated February 1, 1991.

   (b) The package shall be maintained in accordance with the maintenance program in the supplement dated February 1, 1991.

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

11. Expiration date: October 31, 2005.

REFERENCES

Teledyne Energy Systems application dated November 12, 1990.

Teledyne supplement dated: February 1, 1991.

Department of the Navy supplement dated: February 7, 1994, and September 20, 1995, April 16, 1998, and April 27, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 28, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9034	11	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
San Diego, CA 92186-9784

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Atomic Company application dated October 4, 1995, 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-I

(2) Description

TRIGA fuel element shipping container. The outer packaging is a steel drum, approximately 22.5 inches in diameter by 39-1/4 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/ft^3. Maximum gross weight including contents is approximately 235 pounds.

(3) Drawing

The packaging is constructed in accordance with General Atomic Company Drawing No. TOS396C160, Rev. G.

5. (b) Contents

(1) Type and form of material

TRIGA fuel elements containing uranium-zirconium-hydride or erbium-uranium-zirconium-hydride with nominal fuel composition (excluding erbium content) as described in Table A.1-1 of the October 4, 1995 application, and clad with stainless steel, aluminum or incoloy. Uranium enriched to a maximum 93.5 w/o in the U-235 isotope. The H to Zr atomic ratio within the fuel meat must not exceed 1.65.

(2) Maximum quantity of material per package

U-235 content not to exceed 1.39 kg, contained in a maximum of 7 1.5-inch diameter fuel elements, or a maximum of 25 0.5-inch diameter fuel elements, with nominal fuel composition (excluding erbium content) as described in Table A.1-2 (Rev. 1) of the October 4, 1995, application. For enrichments greater than 5 weight percent U-235, uranium content not to exceed an A_2 quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

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

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 8 of the application.

(b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 9 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: December 31, 2000.

REFERENCES

General Atomic Company application dated October 4, 1995.

Supplement dated: December 5, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 3/25/96

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9035	17	USA/9035/B(U)-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

AEA Technology/QSA, Inc. application dated February 15, 1999, as supplemented.

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 No.: 680-OP

(2) Description

The Model No. 680-OP consists of a gamma ray projector within a protective carbon steel container. The protective container is of welded steel construction and is approximately 32 inches long, 10 inches wide, and 18 ½ inches high. Polyurethane foam and wood inserts locate the Model 680 series projectors in the center of the container and provide impact protection.

The 680 series projectors include the Model Nos. 680, 680E, 680A, 680AE, 680B and 680BE. The primary components of the projector consist of an outer steel shell, internal bracing, polyurethane foam, depleted uranium shield, and an "S" tube. The radioactive contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. A 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. Tamper-proof seals are provided on the outer steel container. The dimensions of the projector are approximately 21 inches long, 14 5/8 inches wide, and 10 7/16 inches high. The maximum weight of the package is 615 pounds and the maximum weight of the projector is 465 pounds.

(3) Drawings

The package is constructed in accordance with AEA Technology/QSA, Inc. Drawing Nos. R68090, Rev. D, Sheets 1-5, R680NP, Rev. A, R85791 Rev. A, Sheets 1-2, R67691, Rev. A, R67692, Rev. A, R97011, Rev. C, R97010, Rev. E, Sheets 1-3, and R97013, Rev. F, Sheets 1-2.

(b) Contents

(1) Type and form of material:

Cobalt 60 as sealed sources which meet the requirements of special form radioactive material.

5.(b) Contents (continued)

(2) Maximum quantity of material per package:

110 curies (output)

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. The source shall be secured in the shielded position of the packaging by the source assembly lock, lock cap and safety plug assembly. The source assembly lock, lock cap and safety plug assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one half hour and maintaining their positioning function. The locking ball 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must meet the Acceptance Tests and Maintenance Program of Section 8 of the application; and

(b) Each package shall be operated and prepared for shipment in accordance with Section 7 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: May 31, 2005.

REFERENCES

AEA Technology QSA, Inc. application dated February 15, 1999.

Supplements dated: April 20, June 7, and September 16 and 21, 1999; and January 18 and June 9, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 25, 2000

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9036	8	USA/9036/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Source Production & Equipment Co.
113 Teal Street
St. Rose, LA 70087-9691

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Source Production & Equipment Company application dated November 13, 1989, 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

The packaging consists of an outer overpack and a uranium shielded radiographic source changer. The source changer configuration is that of a rectangular box approximately 9" high x 7.5" wide x 7.5" 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. The overpack is a 12-gallon, 20- or 22-gage steel drum partially filled with foam. The weight of the source changer is 51 to 70 lbs. The weight of the overpack is 19 to 22 lbs. Up to 8 lbs of ancillary equipment may be included within the overpack. The maximum gross weight of the package is 100 lbs.

(3) Drawings

The package is constructed in accordance with Source Production & Equipment Company Inc. Drawing Nos. 11489-1, Rev (4); 11489-2, Rev. (3); and 61090, Rev. (0).

(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

Two sealed sources with a combined activity not to exceed 240 curies.

6. Tungsten shield pads, with dimensions up to approximately 2-inches diameter and 1/2-inch thick, may be welded to the inside surface of the source changer housing.

7. The nameplate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.

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

   a. The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application dated November 13, 1989, as supplemented June 19, September 24, and October 17, 1990.

   b. The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application dated November 13, 1989, as supplemented June 19, and September 24, 1990.

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, 2000.

REFERENCES

Source Production & Equipment Company applications dated November 13, 1989, and July 13, 1990.

Supplements dated: June 19, September 24, and October 17, 1990; November 29, and December 6, 1993; and July 31, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Section Leader
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: SEP 15 1995

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9037	11	USA/9037/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
San Diego, CA 92186-9784

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Atomic Company application dated October 4, 1995, 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-II

(2) Description

TRIGA fuel element shipping container. The outer packaging is a steel drum, approximately 22.5 inches in diameter by 57.5 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/ft^3. Maximum gross weight including contents is approximately 330 pounds.

(3) Drawing

The packaging is constructed in accordance with General Atomic Company Drawing No. TOS396C161, Rev. F.

5. (b) Contents

(1) Type and form of material

Special function TRIGA fuel elements containing uranium-zirconium-hydride or erbium-uranium-zirconium-hydride whose fuel portion has nominal compositions (except erbium content) as described in Table A.1-1 of the October 4, 1995, application, and clad with stainless steel, aluminum or incoloy. Uranium enriched to a maximum 93.5 w/o in the U-235 isotope. The H to Zr atomic ratio within the fuel meat must not exceed 1.65.

(2) Maximum quantity of material per package

U-235 content not to exceed 1.39 kg, contained in a maximum of 7 1.5-inch diameter fuel elements, or a maximum of 25 0.5-inch diameter fuel elements, whose fuel portion has nominal compositions (except erbium content) as described in Table A.1-2 (Rev. 1) of the October 4, 1995, application. For enrichments greater than 5 weight percent U-235, uranium content not to exceed an A_2 quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

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

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 8 of the application.

(b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 9 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: December 31, 2000.

REFERENCES

General Atomic Company application dated October 4, 1995.

Supplement dated: December 5, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 3/25/96

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9039	9	USA/9039/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Amersham Corporation
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Amersham Corporation application dated May 11, 1995, as supplemented

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 Sentinel, Amersham Corporation Drawing Nos.:

Model No.	Drawing Nos.
Overpack	R715, Rev. B
533	R53390, Rev. A
616	R61690, Rev. A
644	R64490, Rev. A
713	R71390, Rev. A

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 (output) contained in the Model No. 533, Model No. 644 or Model No. 713 radiographic device.

(ii) 240 (output) curies contained in the Model No. 616 radiographic device.

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

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, and Drawing Nos. 42401, Rev. 2, 42409, Rev. B.

7. Separate molded fillers shall be used for each model type radiographic device to ensure a snug fit within the overpack.

8. Nameplates shall be fabricated from tin and capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. In addition to the requirements of Subpart C of 10 CFR Part 71:

(a) The package shall be prepared for shipment and operated in accordance with Section 7 of the application, as supplemented.

(b) Each package must be tested and maintained in accordance with the acceptance tests and maintenance program in section 8 of the application, as supplemented.

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

11. Expiration date: December 31, 2000.

UNITED STATES NUCLEAR REGULATORY COMMISSION

Page 3 - Certificate No. 9039 - Revision No. 9 - Docket No. 71-9039

REFERENCE

Amersham corporation application dated May 11, 1995.

Supplement dated: November 29, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 12/18/95

NRC FORM 618
(9-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1.a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9049	8	USA/9094/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO (Name and Address)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Advanced Medical System, Inc. application dated September 28, 1990, 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	8,100

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawing Nos.:

212E246, Rev. 7
106D3870, Rev. 11
706E790, Rev. 4
106D3855, Rev. 4
129D4690, Rev. 0

Page 2 - Certificate No. 9049 - Revision No. 8 - Docket No. 71-9049

5. (b) Contents

(1) Type and form of material

Byproduct material meeting the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 780 watts.

6. Shoring must be provided to minimize movement of contents during accident conditions of transport.

7. Package contents must be delivered to a carrier dry.

8. Prior to each shipment the silicone rubber lid gasket must be inspected. This gasket must be replaced if inspection shows any defects or every 12 months, whichever occurs first. Cavity drain line must be sealed with appropriate sealant applied to threads of pipe plug, or must be permanently closed and sealed.

9. In addition to the requirements of Subpart C of 10 CFR Part 71, the package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7.0, and must be maintained in accordance with the Maintenance program of Section 8.2 of the application.

10. Fabrication of additional packages 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: December 31, 2000.

REFERENCES

Advanced Medical System, Inc. application dated September 28, 1990.

Supplement dated: October 9, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 11/22/95

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9056	11	USA/9056/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Source Production and
Equipment Company, Inc.
113 Teal Street
St. Rose, LA 70087

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Source Production and Equipment Company Inc., application dated March 24, 2000, 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 approximately 13-3/8" long by 4-11/16" high by 4-3/8" wide with a maximum gross weight of 56 pounds.

(3) Drawings

The packaging is constructed in accordance with Source Production and Equipment Company, Inc. Drawing Nos. 12688-1, Rev. (2); 788-1, Rev. (4); and 788-2, Rev. (0).

The packaging may also be as shown in Source Production and Equipment Company Drawing No. 1000, Rev. (0), provided fabrication was completed prior to June 8, 1989.

The overpack is a 12 gallon open head 20 or 22 gauge National Motor Freight Classification 100-H, or succeeding issues, Item 260 steel drum constructed in accordance with Source Production and Equipment Company, Inc. Drawing No. 53189-2, Rev. (2).

(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

225 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. For transportation of more than 45 curies per package in private carriage the shipment must be in accordance with 49 CFR 173.441(b).

9. For transportation of more than 45 curies per package by a common carrier, the package must be within a protective overpack as described and constructed in accordance with 5(a)(3).

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

    (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application, as supplemented; and

    (b) The package must meet the Acceptance Test and Maintenance Program of Section 8.0 of the application, as supplemented.

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: April 30, 2005.

REFERENCES

Source Production and Equipment Company, Inc. application dated March 24, 2000.

Supplement dated: March 30, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: April 10, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9057	8	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
San Diego, CA 92138

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Gulf Energy & Environmental Systems application dated August 3, 1973, as supplemented.

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.

5.(b) Contents (continued)

(2) Maximum quantity of material per package

Total contents not to exceed 200 pounds. Fissile material not to exceed 350 grams U-235. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 2.5

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. Shipments are restricted to transport between the licensee's Sorrento Valley Fuel Manufacturing Facility and other on-site facilities.

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

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in the application dated August 16, 1990.

(b) The packaging must be maintained in accordance with the Maintenance Program in the application dated August 16, 1990.

9. Expiration date: September 30, 2000.

REFERENCES

Gulf Energy & Environmental Systems application dated August 3, 1973.

General Atomics supplement dated August 16, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 3/22/96

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9067	6	USA/9067/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy application dated November 7, 1991, as supplemented.

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 a recessed, plug-type lid and a 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 are 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-lb. skid)

(3) Drawings

The packaging is constructed in accordance with Battelle Memorial Institute Drawing No. BCL3-01, Sheets 1 & 2, Rev. C.

The inner can assembly is constructed in accordance with Battelle Memorial Institute Drawing No. BCL3-38, Rev. B.

5. (b) Contents

(1) Type and form of material.

Byproduct material, source material, and special nuclear material in solid metal or oxide form, which is packaged within the inner can assembly specified in Item 5(a)(3), or which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Not to exceed 300 watts decay heat, and

(i) Fissile material not to exceed 100 grams U-235 equivalent mass.

(ii) Fissile material not to exceed 2,000 grams U-235 equivalent mass.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For contents described in 5(b)(1) and limited in 5(b)(2)(i):	0.4
For contents described in 5(b)(1) and limited in 5(b)(2)(ii):	100

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

8. 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.

9. The maximum gross weight of the cavity contents must not exceed 40 pounds (inner can assembly, radioactive material, etc.).

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

(a) Each package shall be maintained in accordance with Section 8.0 of the application, as supplemented.

(b) Each package shall be operated and prepared for shipment in accordance with Section 7.0 of the application, as supplemented.

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, 2002.

REFERENCES

U.S. Department of Energy application dated November 7, 1991.

Supplement dated: April 10, 1992; and January 27 and August 18, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 23, 1997

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9068	6	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy application dated November 7, 1991, as supplemented.

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

A steel encased, lead shielded shipping package. The packaging is provided with a 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
Lead shielding, in.	4.5
Loaded weight, lb.	1,360 (incl 110-lb. skid)

(3) Drawings

The packaging is constructed in accordance with Battelle Memorial Institute Drawing No. BCL2-01, Sheets 1 and 2, Rev. D.

The inner can assembly is constructed in accordance with Battelle Memorial Institute Drawing No. BCL2-47, Rev. B.

5. (b) Contents

(1) Type and form of material

Byproduct material, source material, and special nuclear material in solid metal or oxide form, which is packaged within the inner can assembly specified in Item 5(a)(3), or which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Not to exceed 200 watts decay heat, and

(i) Fissile material not to exceed 50 grams U-235 equivalent mass.

(ii) Fissile material not to exceed 2,000 grams U-235 equivalent mass.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For contents described in 5(b)(1) and limited in 5(b)(2)(i):	0.4
For contents described in 5(b)(1) and limited in 5(b)(2)(ii):	100

6. Plutonium in excess of 20 curies per package must be in the form of metal, metal alloy or reactor fuel elements.

7. 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.

8. 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.

9. The maximum gross weight of the cavity contents must not exceed 20 pounds (inner can assembly, radioactive material, etc.)

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

(i) Each package shall be maintained in accordance with Section 8.0 of the application, as supplemented.

(ii) The package shall be prepared for shipment and operated in accordance with Section 7.0 of the application, as supplemented.

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: May 31, 2002.

REFERENCE

U.S. Department of Energy application dated November 7, 1991.

Supplements dated: April 10, 1992; and January 27, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 21, 1997

NRC FORM 618
(3-96)
10 CFR 71

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
9069	11	USA/9069/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

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) Drawings

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. 1.

5.(b) Contents

(1) Type and form of material

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

(2) Maximum quantity of material per package

Two inner containers as described in 5(a)(3) containing not more than a total of 70 kilograms U-235.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 1.6

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

   (a) The package must be prepared for shipment and operated in accordance with Chapter 6.0 of the application.

   (b) Each packaging must meet the acceptance tests and maintenance program of Chapter 7.0 of the application.

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: December 31, 2002.

REFERENCES

Westinghouse Electric Corporation application dated October 30, 1981.

Westinghouse supplements dated January 24, 1992 and December 31, 1996.

Department of Energy supplements dated: April 2 and June 14, 1984; December 24, 1996; and November 7 and December 10, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: December 16, 1997

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9070	14	USA/9070/B(U)	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Packaging Technology, Inc.
4507-D Pacific Highway East
Tacoma, WA 98424-2633

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

VECTRA Technologies, Inc. application dated July 21, 1994, as supplemented.

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 steel drum. 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 18 or 20-gauge galvanized steel shell is filled with 3-pound per cubic foot rigid polyurethane foam. The inner shell is molded fiberglass. 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. The steel drum is minimum 18-gauge steel with a minimum 14-gauge lid and a gasket. Closure of the drum is by way of a 12-gauge locking ring with dropped forged lugs and a 5/8-inch diameter bolt and lock nut. 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, or X-60-200D-SP, Rev. J.

(b) Contents

(1) Type and form of material

(a) Radioactive material in the form of dewatered, solid or solidified materials meeting the requirements of low specific activity material, contained in steel drums.

(b) Radioactive material meeting the requirements of special form radioactive material, contained in steel drums.

(c) Radioactive material in the form of solid metal pieces or activated solid metal components, contained in steel drums.

(2) Maximum quantity of material per package

Greater than Type A quantities of radioactive material. Fissile material contents not to exceed the generally licensed mass limits as specified in 10 CFR §§71.18 and 71.22. Plutonium in excess of 20 curies per package must be in the form of metal, metal alloy or reactor fuel elements, or must meet the requirements of special form radioactive material. Internal decay heat not to exceed 3 watts.

6. The maximum weight of contents, including drum, not to exceed 550 pounds.

7. The steel drum must be in accordance with Appendix 1.3.2 of the supplement dated October 20, 1994.

8. The drum must be securely positioned in the overpack.

9. Contents must be securely positioned so that protrusions will not puncture the drum under normal or accident conditions.

10. The lifting lugs must be rendered inoperable for tie-down during transport.

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

(a) The package must meet the Acceptance Tests and Maintenance Program of Chapter 8.0 of the application; and

(b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7.0 of the application.

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

13. Expiration date: January 31, 2005.

REFERENCES

VECTRA Technologies, Incorporated, application dated July 21, 1994.

Supplements dated: August 22 and October 20, 1994; and February 6, 1998.

Transnuclear, Inc., supplement dated February 5, 1998, and December 3, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: February 4, 2000

NRC FORM 618
(3-96)
10 CFR 71

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
9071	6	USA/9071/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

ANEFCO, Incorporated
P.O. Box 171
Moodus, CT 06469

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

ANEFCO application received June 14, 1976, with report, "Safety Analysis Report Cask AP-101," as supplemented.

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.

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. A dry loaded package need not be vacuum dried provided the "empty" cask cavity and drain lines are verified not to contain liquid prior to each loading.

7. Except for close fitting contents, appropriate shoring must be used in the cask cavity to limit movement of the contents during accident conditions of transport.

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

a. The package must be operated and maintained in accordance with procedures in supplement dated December 12, 1991.

b. Prior to each shipment the gask-o-seal closure seal must be inspected. The gask-o-seal closure seal and the cavity drain O-ring seals must be replaced with new seals within the 12-month period prior to shipment, or earlier if inspection shows any defect.

c. The package must be leak tested prior to each shipment in accordance with operating procedures in supplement dated December 12, 1991.

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, 2002.

REFERENCES

ANEFCO, Incorporated Safety Analysis Report Cask AP-101, received June 14, 1976.

Supplements dated: July 21, August 6, and October 21, 1976; April 2 and September 12, 1986; September 26 and December 12, 1991; and November 25, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: 01/17/97

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9081	12	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Chem-Nuclear Systems, LLC
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc. application dated November 24, 1987, 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, 2, and 3, Rev. 7; and C-112-B-0006, 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.

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 or by analysis 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/ft^3 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.

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

    (a) The package shall be prepared for shipment and operated accordance with the Operating Procedures in Chapter 7 of the application.

    (b) The package shall be maintained in accordance with the Maintenance Program in Chapter 8 of the application.

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: January 31, 2003.

REFERENCES

Chem-Nuclear Systems, Inc. application dated November 24, 1987.

Supplements dated: November 24, 1992, October 31, 1997, July 28, 1999, and January 5, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: February 4, 2000

NRC FORM 618
(3-96)
10 CFR 71

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
9098	9	USA/9098/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Department of Energy application dated March 31, 1998, as supplemented.

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.: CI-20WC-2 and CI-20WC-2A

(2) Description

Steel encased, wooden outer protective jackets with a uranium shielded cask and inner steel containment vessel. The protective jackets are constructed of disks and rings of plywood, which are glued together and reinforced with steel rods. The protective jackets are contained within an 18-gauge steel drum. 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 container. The gross weight of the packages is about 400 pounds.

Model No.	CI-20WC-2	CI-20WC-2A
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 Cintichem Inc. Drawing Nos.:

Model No. CI-20WC-2
101259, Rev. D and 100964, Rev. H

Model No. CI-20WC-2A
101354, Rev. G and 101326, Rev. F

Inner Containment Vessel
101401, Rev. C

(b) Contents

(1) Type and form of material

(i) Mo-99/Tc-99 in normal form as solids or liquids.

(ii) I-131 in normal form as liquids.

(2) Maximum quantity of material per package

(i) For contents described in 5(b)(1)(i):
1,000 curies

(ii) For contents described in 5(b)(1)(ii):
200 curies

6. Contents must be contained within the inner containment vessel specified in 5(a)(3).

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

a. The package must be prepared for shipment and operated in accordance with the operating procedures (PO-05, PO-06 and PO-08) of the application.

b. The package must be maintained in accordance with the maintenance procedures (PO-06) of the application.

c. The inner containment vessel neoprene O-ring seal must be replaced prior to each shipment.

d. Prior to each shipment, the loaded inner containment vessel must show no leakage when tested to a sensitivity of at least 1×10^{-5} std-cm^3/sec.

e. The inner containment vessel must be leak tested within 12 months prior to use in accordance with the leak test procedure (PO-07) of the application. The inner containment vessel must show no leakage greater than 1×10^{-7} std-cm^3/sec.

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 their 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: May 31, 2004.

REFERENCES

Department of Energy application dated March 31, 1998.

Supplements dated: November 4, 1998, and April 19, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 6/7/99

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9099	9	USA/9099/B(U)F-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO (*Name and Address*)

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

ATR Fresh Fuel Shipping Container
Safety Analysis Report, INEL-94/0275,
January 27, 1999, as supplemented

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, 69-7/16 inches x 26-13/16 inches x 6-15/16 inches, constructed of 3/4-inch plywood, covered with 16-gauge steel. The top and bottom are lined with high density polyethylene foam and with a 0.020-inch cadmium plate. Wood spacers covered with sponge rubber and with a 0.020-inch thick 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, 73-15/16 inches x 31-3/4 inches x 11-3/16 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.

(3) Drawings

The packaging is fabricated in accordance with EG&G Idaho, Inc., Drawing No. 445721, Sheets 1, 2, and 3; and EG&G Idaho, Inc., Drawing No. 445722, Sheets 1 and 2.

(b) Contents

(1) Type and form of material

Unirradiated ATR fuel elements. Each element contains 19 formed fuel plates, clad in Aluminum 6061. Each element contains a maximum of 1,100 grams of U-235 in uranium that is enriched to a maximum of 94 wt% in the U-235 isotope.

(2) Maximum quantity of material per package

Up to four (4) unirradiated ATR fuel elements. Total U-235 content not to exceed 4,400 grams per package.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 4.2

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

   (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application.

   (b) Each packaging must be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 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: January 31, 2004.

REFERENCES

ATR Fresh Fuel Shipping Container Safety Analysis Report, INEL-94/0275, January 27, 1999.

Supplements dated: February 18, 1999 and April 27, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: June 15, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9102	8	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Neutron Products, Inc.
22301 Mt. Ephraim Road
Dickerson, MD 20842

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Neutron Products, Inc., 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 wooder 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 overpack is a 48-inch diameter, 12 gauge steel body with a wooden shell 38-1/4 inches in height made of 3/4-inch thick plywood sheets glued together and reinforced by 16 steel tie rods and 32 lug screws. Positive clsoure of the overpack lid is accomplished by 3 equally spaced bracket assemblies with attached chains and held together with a 3/8-inch by 4-inch welded ring. The maximum packge gross weight is 6,000 pounds.

(3) Drawings

The Model No. NPI-20WC- packaging is constructed in accordance with Neutron Products, Inc. Drawing No. 240010, Rev. C. The overpack is constructed in accordance with Neutron Products Inc. Drawing Nos. 240160, Sheet 1, Rev. None and 240160, Sheet 2, Rev. A.

(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 must not exceed 9,500 curies. The maximum internal decay heat must not exceed 150 thermal watts.

6. The contents must 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 must not exceed 6,000 pounds and the inner shielded cask shall be snug-fitting within the wooden overpack.

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

   (a) The package must be prepared for shipment and operated in accordance with the operating procedures in the supplement dated September 21, 1993.

   (b) The package must meet the Acceptance Test and Maintenance program in the supplement dated September 21, 1993.

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: October 31, 2003.

REFERENCES

Neutron Products, Inc., application dated August 31, 1977.

Supplements dated: February 6, 1978; July 31, 1985; August 2 and September 7, 1988; September 21, 1993; and September 23, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: October 16, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9107	6	USA/9107/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Amersham Corporation
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Technical Operations, Inc. application
dated December 30, 1982, as supplemented.

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. The capacity of the container is 110 curies of cobalt 60. 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.

5. (3) Drawings

The packaging is constructed in accordance with the Technical Operations, Inc. Drawing No. 77190, Sheets 1 through 6, Rev. 0.

(b) Contents

(I) 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (1) The package must be prepared for shipment and operated in accordance with the Operating Procedures in the supplement dated April 29, 1998; and,

   (2) Each package must be maintained and acceptance tested in accordance with the Acceptance Tests and Maintenance Program in the supplement dated April 29, 1998.

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: June 30, 2003.

REFERENCES

Technical Operations, Inc., application dated December 30, 1982.

Supplements dated February 16, April 13, and April 28, 1993; and April 29, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 18, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9132	13	USA/9132/B(M)F	1	5

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc. application dated April 22, 1985, 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 encased rigid polyurethane foam (20 lb/ft3) impact limiters. The overall dimensions are 213.2 inches in length and 2 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 1-inch thick stainless steel shell overlayed with a 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 8 inches.

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 Viton O-ring seals. The top end of the containment vessel is sealed with a 11.625-inch thick stainless steel plug with two Viton O-ring seals. The bottom plug is retained by a closure plate secured by eight, 1/2"-13UNC x 2-1/4-inch ASTM A320, Grade L7 socket head cap screws. The top plug is secured in place utilizing 16, 1/2"-13UNC x 1-3/4-inch ASTM A320, Grade L7 hex flange screws.

5.(a)(2)(continued)

No drain or vents penetrate directly into the containment vessel. A drain/vent line opens directly into the area between the two 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 trunions, four 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 38,200 pounds.

(3) Drawings

The packaging is constructed in accordance with Energy Research and Development Administration (ERDA) Drawing No. H-4-66230, Sheets 1, 3, 5, and 6, Revision No. 0, and Sheets 2 and 4, Revision No. 1. For payloads in spent fuel containers, the applicable drawings are DOE Drawing Nos. H-3-47474, Sheets 1 and 2, Revision No. 0, and H-4-66535, Revision No. 0, and Los Alamos Drawing No. 54Y-110854, Sheets 1 and 2, Revision No. B.

5.(b) Contents

Type, form, and maximum quantity of material per package

Irradiated, (a) mixed oxide (MOX) fuel pins and assemblies; (b) reactor fuel comprised of U-235 and/or Pu-239 oxides, carbides, nitrides, or metallic alloys; and (c) structural components. The minimum cooling time of each assembly and rod must be 90 days, and the cask may contain 1,400 thermal watts. Prior to irradiation, the fuel and structural components must have the following specifications:

Type	Fuel Description*	Array Description	Maximum Fissile Package Loading	Pin Dimensions
217-Pin DFA assembly	31% PuO_2 - 69% UO_2 (natural U)	Hexagonal array w/pins at 0.26" center-to-center	11.2 kg	0.23" dia 36" active fuel length
217-Pin MOX fuel pins	50% max PuO_6 + $^{235}UO_2$ - remainder natural UO_2	Circular array groups of pins in seven compartments in 5" Schedule 5 Pipe	27.5 kg	0.23"-0.29" dia. 36" active fuel length

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Type	Fuel Description*	Array Description	Maximum Fissile Package Loading	Pin Dimensions
109-Pin MOX fuel pins	35% PuO_2 -65% UO_2 (86% U-235)	Circular array individual pins contained in 0.44" dia. tubes	26.2 kg	0.23"-0.29" dia. 36" active fuel length
55-Pin MOX fuel pins	35% PuO_2 -65% UO_2 (86% U-235)	Circular array individual pins contained in 0.625" dia. tubes	13.2 kg	0.23"-0.29" dia. 36" active fuel length
37-Pin MOX fuel pins	35% PuO_2 -65% UO_2 (86% U-235)	Circular array individual pins contained in 0.75" dia. tubes	8.9 kg	0.23"-0.29" dia. 36" active fuel length
42-Pin MOX	35% PuO_2 -65% UO_2 (86% U-235)	Circular array individual pins contained in 0.625" dia. tubes	10.1 kg	0.23"-0.29" dia. 36" active fuel length
40-Pin MOX fuel pins	35% PuO_2 -65% UO_2 (86% U-235)	Circular array individual pins contained in 0.625" dia. tubes	9.6 kg	0.23"-0.29" dia. 36" active fuel length
19-Pin MOX fuel pins	35% PuO_2 -65% UO_2 (86% U-235)	Circular array individual pins contained in 0.88" dia. tubes	4.6 kg	0.23"-0.29" dia. 36" active fuel length
PU compounds fuel pins (spent fuel containers)	50% PUX max-UX X=C,N, or O (94% U-235)	Unrestricted array individual pins contained in SS 5-inch Schedule 40 pipe	8.0 kg	Container cavity 5.047" dia. by 38.9" length
LAMPRE fuel pins (spent fuel container)	97.5% Pu max-X alloy X=Fe, Co or Cs	Circular array individual pins contained in 0.625" or 0.75" dia. steel tubes	8.0 kg	0.425" dia. 38" active fuel length

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Type	Fuel Description*	Array Description	Maximum Fissile Package Loading	Pin Dimensions
Structural components (incl. control assemblies)	Dosimetry foils	--	1.0 kg	--
24 max. Pins. U-Pu carbide fuel pins	85-94%(Pu-U)C -6 to 15% $(Pu\text{-}U_2)C_3$. Max 23% Pu, uranium is not enriched	Circular array; individual pins contained in 0.625-in. dia. tubes within 5-in. Schedule 40 pipe	3.0 kg	0.37" outer dia. 36" active fuel length
18 max. Pins. Sodium bonded (fuel-to-clad)	10% Zr-20% Pu max. Remainder U (U enriched to 40% max. (U-235)	Circular array; individual pins contained in 0.625-in. diam. tubes within 5-in. Schedule 40 pipe	1.9 kg	0.30" outer dia. 36" active fuel length

*All plutonium in the fuel types (1) thru (8) contains at least 10% Pu-240; fuel type (9) has no limit for PU-240; type (10) contains at least 6% PU-240.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Content 5.(b)(1) shown in AEC Drawing No. H-4-21500, Rev. 9, and ERDA Drawing No. H-4-66230, Sheet 5, Rev. 0.

Contents 5.(b)(2), (3), (4), and (5) must be contained within inner container Ident 69 described by ERDA Drawing Nos. H-4-66160, Sheet 1, Rev. 0, and H-4-66230, Sheets 5 and 6, Rev. 0.

Contents 5.(b)(6), (7), (8), (12) and (13) must be contained within inner container Ident 1578 described by ERDA Drawing Nos. H-4-66160, Sheet 2, Rev. 0, and H-4-66230, Sheets 5 and 6, Rev. 0.

Contents 5.(b)(9) and (10) shown in DOE Drawing No. H-3-47474, Sheets 1 and 2, Revision No. 0, and Los Alamos Drawing No. 54Y-110854, Sheets 1 and 2, Revision No. B must be contained within the Ident 69 Liner shown in ERDA Drawing No. H-4-66230, Sheets 5 and 6, Revision No. 0, and DOE Drawing No. H-4-66535, Revision No. 0.

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 7.4 of the application are adhered to.

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

   (a) Each package must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application, as supplemented. The leak test to satisfy ANSI N 14.5 and Regulatory Guide 7.4 in Section 8.1.3 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.

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

9. Any repair to the trunnions because of out-of-roundness or weld failure must be authorized by NRC prior to returning the package to service.

10. The containment closure bolts (as specified by Note 9, Drawing No. H-4-66230, Sheet 1, Revision No. 0) 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. Effective Date: April 1, 1996. Expiration Date: April 1, 2001.

REFERENCES

Nuclear Packaging, Inc., application dated April 22, 1985.

Supplements dated: October 8 and 31, 1985; February 4, 1986; March 21, 1986; May 24, 1988; September 11, 1990; March 22, 1991; and February 21, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 3/21/96

NRC FORM 618
(3-96)
10 CFR 71

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
9148	5	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Amersham Corporation
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

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

A steel encased uranium shielded source changer for radiographic sources in special form. The 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 shield. 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.

(3) Drawing

The packaging is constructed in accordance with Technical Operations, Inc. Drawing No. 77090 - Sheets 1 through 6, Rev. 3.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with the operating procedures in the application; and

   (b) The package shall be maintained in accordance with the maintenance program in in the application.

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

11. Expiration date: March 31, 2002.

REFERENCES

Technical Operations, Inc. application dated March 24, 1981.

Supplements dated: January 18, and May 10, 1982; February 25, and April 16, 1992; September 20, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: March 19, 1997

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9150	5	USA/9150/B(U)-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

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 (AQ-2). 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 the 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.

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) Drawing 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, $Pu(SO_4)_2\ 4H_2O$ and plutonium nitrate dihydrate, $Pu(NO_3)_4\ 2H_2O$.

(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.

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 packages(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).

14. The package authorized for use 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: July 31, 2001.

REFERENCES

PAT-2 (Plutonium Air-Transportable Model 2) Safety Analysis Report, SANDIA Report No. SAND81-0001, July 1981.

DOE application dated April 19, 1983. Supplements dated August 3, 1983, July 15, 1986, July 16, 1991 and May 29, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William Travers

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 7/19/96

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9152	13	USA/9152/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Energy application
dated February 26, 1988, as supplemented.

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 45-1/6" 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" of 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/ft^3 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.

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.

(iii) Greater than Type A quantity of irradiated fuel (dewatered) within secondary containers described in Chem-Nuclear Systems, Inc. application dated July 16, 1985.

(2) Maximum quantity of material per package

For the contents described in 5(b)(1)(i), (ii), and (iii):

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.

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

The maximum U-235 enrichment of the uranium oxide fuel material must not exceed 3 w/o. The average burnup of the fuel material must not exceed 3,165 MWD/MTU and must be cooled for at least 6.0 years. Fissile contents not to exceed 400 grams U-235 prior to irradiation.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For contents described in 5(b)(1)(iii): 100

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 12, SA-354, Type BD, 1-1/4"-7UNC x 2-1/4" long bolts torqued to 270 ft-lbs ± 10% (lubricated) or 360 ft-lbs ± 10% (dry).

8. Prior to each shipment, the leak test 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 or by analysis 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 a 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/ft^3 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 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.

   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 which was submitted with the Department of Energy consolidated application dated February 26, 1988. 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 in hereby approved for use under the general license provisions of 10 CFR §71.12.

12. Expiration date: May 31, 2004.

REFERENCES

Department of Energy consolidated application dated: February 26, 1988.

Department of Energy supplements dated: May 12, 1989; April 11, 1994 and March 24, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 21, 1999

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9157	8	USA/9157/B(U)-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Industrial Nuclear Company
14320 Wicks Blvd.
San Leandro, CA 94577

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Industrial Nuclear Company Application dated June 8, 1999, as supplemented.

c. DOCKET NUMBER 71-9157

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 package is approximately 8.87 inches long, 4.5 inches wide, and 8.5 inches high. The radioactive material contents consist of iridium-192 in source assemblies that meet the requirements for special form material. The source assemblies are positioned within a zircalloy or titanium "S" tube within the IR-100. The "S" tube is surrounded by a shield assembly made of depleted uranium. The uranium shield assembly is encased in a stainless steel housing. The space between the uranium shield assembly and the stainless steel casing is filled with a rigid polyurethane foam. The maximum weight of the IR-100 exposure device is 53 pounds and the maximum shield weight is 32.5 pounds.

(3) Drawings

The packaging is constructed in accordance with Industrial Nuclear Company Drawing Nos.: IR 100-1A, Rev. 3 and IR 100-1B, Rev.2.

(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 (output) curies

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly lock, and lock cap. The shipping plug, source assembly lock, and lock cap 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 lock 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package must meet the Acceptance Tests and Maintenance Program of Section 8 of the application; and

   (b), Each package shall be operated and prepared for shipment in accordance with the operating procedures in accordance with Section 7 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, 2004.

REFERENCES

Industrial Nuclear Company application dated June 8, 1999.

Supplements dated: June 9, August 6 and September 9, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 9/16/99

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9165	4	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Amersham Corporation application dated August 4, 1995, as supplemented.

c. DOCKET NUMBER 71-9165

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 and positioned within the "J" tubes by means of a source cable locking device. The package has an outside diameter of approximately 11.25 inches and outside height of approximately 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 Amersham Corporation Drawing No. R85590, Rev. B, Sheet No. 1 to Sheet No. 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 (output) with no more than 240 curies in a single source.

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for The Design and Construction of Apparatus for Gamma Radiography."

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

   (a) Each packaging must meet the Acceptance Tests and Maintenance Program in Section 8 of the application, as supplemented.

   (b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7 of the application, as supplemented.

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: December 31, 2003.

REFERENCES

Amersham Corporation application dated August 4, 1995.

Supplements dated: September 21, September 28, and November 29, 1995; November 24, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: December 16, 1998

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9168	10	71-9168	USA/9168/B(U)	1	OF	3

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Chem-Nuclear Systems, LLC
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Chem-Nuclear Systems, Inc. application dated February 26, 1990, as supplemented.

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 8-120B

(2) Description

The packaging is a carbon steel encased, lead shielded 74-inch OD by 88-inch high cask for radioactive waste materials. The cask is a right circular cylinder with a 62-inch ID by 75-inch high cavity. The walls of the cask contain a lead thickness of 3.35 inches encased in 0.75-inch thick inner steel shell and 1-1/2-inch thick outer steel shell. The exposed sides of the package are provided with a thermal barrier consisting of a 5/32-inch diameter wire wrap on 12-inch centers and covered with a 3/16-inch thick steel jacket. The bottom weldment is made of two, 3-1/4-inch thick carbon steel plates. The primary lid is sealed with a double silicone O-ring and 20 equally spaced 2-inch diameter bolts. The 29-inch diameter centered secondary lid is sealed with a double silicone O-ring and twelve equally spaced 2-inch diameter bolts. The optional drain line is sealed with a 3/4-inch diameter cap screw and a silicone O-ring. The lid sealing surfaces are stainless steel and the space between the double O-ring seals is provided with a test port for leak testing.

The top and bottom of the cask are provided with steel encased, rigid polyurethane foam impact limiters. The impact limiters are secured to each other about the cask with eight 1-inch diameter ratchet binders. The impact limiters are 102 inches in diameter and the overall height of the package with the impact limiters attached is 132 inches.

The package is provided with four tie-down and two removable lifting devices. Each lid is provided with three lifting lugs. The gross weight of the packaging and contents is approximately 74,000 pounds.

(a) Packaging (Continued)

(3) Drawings

The packaging is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing No. C-110-E-0007, Sheets 1, 2, and 3, Revision No. 9.

(b) Contents

(1) Type and form of material

(i) Byproduct material in the form of dewatered resins, solids, or solidified waste contained within secondary containers; or

(ii) Radioactive material in the form of activated reactor components.

(2) Maximum quantity of material per package

Type B quantity of radioactive material, not to exceed 2,000 times a Type A quantity, 100 thermal watts, and 14,680 pounds including weight of the contents, secondary containers, 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 containers, or activated components, and the cask cavity to prevent movement during accident conditions of transport.

7. The cask primary lid must be secured by twenty and the secondary lid by twelve, 2"-8UNC-2A x 4" long hex cap screws with a flat washer torqued to 500 ft-lbs ± 50 ft-lbs (lubricated).

8. Prior to each shipment, the package must be leak tested in accordance with Section 8.2.2.2 of the application. For contents that meet the definition of low specific activity material or surface contaminated objects in 10 CFR 71.4, and also meet the exemption standard for low specific activity material and surface contaminated objects in 10 CFR 71.10(b)(2), the pre-shipment leak test is not required.

9. 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 Acceptance Tests and Maintenance Program of Section 8.0 of the application,

(ii) The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first. The tests ports and optional drain line must be appropriately plugged and sealed prior to transport, and

(iii) The package must be prepared for shipment and operated in accordance with the operating procedures of Section 7.0 of the application.

10. (a) For any package containing water or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements or by analysis 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/ft^3 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 a 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.

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, 2005.

REFERENCES

Chem-Nuclear Systems, Inc., application dated February 26, 1990.

Supplements dated: February 22, 1994; September 1, 1998; May 25 and June 1, 1999; and May 26, and August 23 and 30, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: September 28, 2000

NRC FORM 618
(3-96)
10 CFR 71

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
9183	13	USA/9183/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

NAC International, Inc.
655 Engineering Drive
Suite 200
Norcross, Georgia 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NAC International, Inc. application dated May 26, 1989, 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 the thickness of the outer shell is 1-1/4 inches. 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 (lead thickness: 6-5/8 inches maximum, 5 inches minimum).

The stainless steel lid is a frustum of a 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 or closed shipping container.

5.(a) (Continued)

(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. 22.

(b) Contents

(1) Type and form of material

(i) Clad, irradiated, metallic natural uranium fuel rods.

(ii) Solid, non-fissile, irradiated hardware.

(2) Maximum quantity of material per package

The cavity content must not exceed a thermal decay heat load of 750 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 6 encapsulated (defective) rods. Each defective rod will be encapsulated in either a 2.75-inch I.D. failed fuel rod can, as shown on Nuclear Assurance Corporation Drawing No. 340-108-D2, Rev. 9, or a 4.00-inch I.D. failed fuel rod can, as shown on Nuclear Assurance Corporation Drawing No. 340-108-D1, Rev. 9. Defective rods encapsulated in the 2.75-inch I.D. failed fuel rod cans will be shipped in a six rod capacity liner, as shown on Nuclear Assurance Corporation Drawing No. 491-001, Rev. 0., and defective rods encapsulated in the 4.00-inch I.D. failed fuel rod cans will be shipped in a three rod capacity liner, as shown on Nuclear Assurance Corporation Drawing No. 347-211-F19, Rev. 5.

(ii) 1,600 MWD/MTU average burn-up.

(iii) Minimum 365-day cooling time after irradiation.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

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 cask may be shipped in a closed shipping container provided that the closed container, the cask tie-down and support system, and the transport vehicle (trailer) meet the applicable requirements of the Department of Transportation. Tie-down devices which are a structural part of the package must comply with 10 CFR §71.45.

9. When the cask is shipped in a closed shipping container, the center of gravity of the combined cask, closed shipping container, and trailer must not exceed 75 inches.

10. When the cask is shipped in a closed shipping container, the internal heat load must not exceed 750 watts.

11. 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.

Cask Component	Period	Test/Action
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 tests. (Test to pressures equal to or greater than those indicated.)

12. The package shall be prepared for shipment and operated in accordance with the operating procedures in Chapter 7 of the application, as supplemented.

13. Each package must be maintained in accordance with the maintenance program in Chapter 8 of the application.

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, 2004.

REFERENCES

NAC International, Inc. application dated May 26, 1989.

Supplements dated January 29 and March 20, 1990; August 4, 1994; and August 31, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Susan J. Shankman for

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

Date: September 24, 1999

NRC FORM 618
(3-96)
10 CFR 71

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
9184	5	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Packaging Technology, Inc.
4507 D Pacific Highway East
Tacoma, WA 98424-2633

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc. consolidated application dated March 31, 1989, 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.

5.(a)(3) Drawings

The package is constructed in accordance with Nuclear Packaging, Inc. Drawing No. X-20-218D, Sheets 1 and 2, Rev. C.

(b) Contents

(1) Type and form of material

(i) Radioactive material in form of liquid or gaseous samples in sample casks, cartridges and vials.

(ii) Byproduct and activation materials as solids and process solids or resins, either dewatered, solid, or solidified in secondary containers.

(2) Maximum quantity of material per package

50 Ci of mixed fission and activation products, 15 milliliters of liquid, one sample cask or secondary container and four cartridges and four vials.

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 must be prepared for shipment in accordance with Chapter 7.0 of the application, and the supplement dated July 8, 1994.

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, 2004.

REFERENCES

Nuclear Packaging, Inc., consolidated application dated March 31, 1989.

Supplement dated: April 7, 1989.

VECTRA Technologies, Inc., supplements dated: July 8, 1994 and January 30, 1998.

Transnuclear, Inc., supplement dated January 30, 1998.

Packaging Technology, Inc., Supplement dated: April 30,1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 7/21/99

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9185	5	USA/9185/B(U)-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Industrial Nuclear Company
14320 Wicks Blvd.
San Leandro, CA 94577

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Industrial Nuclear Company application dated July 1, 1999, as supplemented.

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

The Model No. OP-100 package consists of either an IR-50 source changer, or an IR-100 exposure device, which is positioned within a 10 gallon drum. The drum is made of 20 gauge steel, and is closed with a 12 gauge closure ring and a 5/8 inch diameter steel bolt. Plywood members are used to position and support either the IR-50 or IR-100 within the steel drum.

The IR-50 source changer and the IR-100 exposure device are approximately 8.87 inches long, 4.5 inches wide, and 8.5 inches high. The radioactive material contents consist of iridium-192 in source assemblies that meet the requirements for special form material. The source assemblies are positioned within a zircalloy or titanium "S" tube within the IR-50 or IR-100. The "S" tube is surrounded by a shield assembly made of depleted uranium. The uranium shield assembly is encased in a stainless steel housing. The space between the uranium shield assembly and the stainless steel casing is filled with a rigid polyurethane foam. The maximum weight of the IR-50 source changer is 53 pounds, the maximum weight of the IR-100 exposure device is 50 pounds, and the maximum gross weight of the Model No. OP-100 package is 75 pounds.

(3) Drawings

The packaging is constructed in accordance with Industrial Nuclear Company Drawing Nos.: OP 100-1, Rev. 3, IR 50-1A, Rev. 2, IR 50-1B, Rev. 1, IR 100-1A, Rev. 3, and IR 100-1B, Rev. 2.

(b) Contents

(1) Type and form of material

Iridium-192 as sealed sources that meet the requirements of special form radioactive material.

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(b) Contents (continued)

(2) Maximum quantity of material per package

120 (output) curies

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. The source shall be secured in the shielded position of the packaging by the source assembly lock, lock cap, and the shipping plug (IR-100 only). The source assembly lock, lock cap, and the shipping plug (IR-100 only), 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 source assembly lock. 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 overpack must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintain 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment in accordance with the Operating Procedures of Chapter 7 of the application and

   (b) Each package must meet the Acceptance Tests and Maintenance Program of Chapter 8 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: November 30, 2003.

REFERENCES

Industrial Nuclear Company application dated July 1, 1999.

Supplements dated: September 14 and December 29, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 2/26/00

NRC FORM 618
(3-96)
10 CFR 71

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
9186	12	USA/9186/B(U)F	1	5

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis for Shipping S8G Power Units in the S-6213 Container, Rev. 7, dated June 16, 1975, as supplemented; and Safety Analysis for Shipment of S6W Shipboard Power Units in the Model 2 S-6213 PUSC, 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 Nos: Model 1, S-6213 Power Unit Shipping Container

Model 2, 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 Model 1 S-6213 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. The Model 2 S-6213 PUSC is of the same design as the Model 1, except that the primary container material is HY-80 steel. 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 and 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 (S8G Power Unit Type B only). A lower support adapter is installed in the barrel end of the container during shipment of the S6W prototype power unit and the S6W shipboard power unit. A shipping/lifting ring, a flange adapter, and a lower support adapter are installed in the container during shipment of the S9G shipboard power unit.

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 for shipments of Type A and B, S8G power units.

5.(a) Packaging (Continued)

(2) Description (Continued)

The weight of the PUSC, including frame and contents is approximately 438,900 pounds for shipment of the S6W prototype power unit, 429,900 pounds for shipment of the S6W shipboard power unit, and 329,000 pounds for shipment of the S9G shipboard power unit.

(3) Drawings

The Model 1 and Model 2 S-6213 PUSC are constructed in accordance with the Drawings included in the applications (see references, below).

(b) Contents

(1) Type and form of material

(i) Unirradiated Naval Reactors Type A or B S8G power unit as described in Chapter 5 of the application and containing uranium enriched in the U-235 isotope.

(ii) Unirradiated S6W advanced fleet reactor prototype power unit or unirradiated S6W advanced fleet reactor shipboard power unit as described in Chapter 6 of "S6W Prototype Power Unit in S-6213 Power Unit Shipping Container Safety Analysis Report" WAPD-REO(c)1219, Revision 1, and containing uranium enriched in the U-235 isotope.

(iii) Unirradiated S6W high performance fleet core shipboard power unit, as described in addendum to Chapter 6 of "S6W Shipboard Power Unit in S-6213 Power Unit Shipping Container Safety Analysis Report For Packaging," WAPD-REO(c)-1457 and WAPD-REO(c)-1566, and containing uranium enriched in the U-235 isotope.

(iv) Unirradiated S9G shipboard power unit, as described in Chapter 6 of "S9G Shipboard Power Unit in S-6213 Power Unit Shipping Container Safety Analysis Report For Packaging," Revision 2, and containing uranium enriched in the U-235 isotope.

(2) Maximum quantity of material per package

For the Model 1 S-6213 PUSC:

One Type A S8G Power Unit, or
One Type B S8G Power Unit, or
One S6W Advanced Fleet Reactor Prototype Power Unit, or
One S6W Advanced Fleet Reactor Shipboard Power Unit, or
One S6W High Performance Fleet Core Shipboard Power Unit, or
One S9G Shipboard Power Unit.

5.(b) Contents (Continued)

For the Model 2 S-6213 PUSC:

One S6W Advanced Fleet Reactor Shipboard Power Unit, or
One S6W High Performance Fleet Core Shipboard Power Unit, or
One S9G Shipboard Power Unit.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on
label for nuclear criticality control: 100

6. The Model 1 S-6213 PUSC shall be designated as B( )F. Use of Model 1 S-6213 PUSC packaging fabricated after August 31, 1986, is not authorized.

7. All control rods shall be restrained in the power unit fuel cells by the control rod holddown latches.

8. For the Model 1 S-6213 PUSC, 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.

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* This requirement shall not be construed to require an inspection if previous shipment had been inspected in accordance with (8(a)(1)) above.

(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, Section 12.4, 12.4.1 (General), 12.4.3 (Dry powder), 12.4.3.3.2.1 (Yoke Technique) using direct or rectified current.

8.(c) If any indications, as defined in accordance with either:

(1) Paragraph UA-93(a), Appendix VIII, Division 1, Section VIII, ASME Code (with 7(b)(2)(i), above), or

(2) Paragraphs UA-72 and UA-73, Appendix VI, Division 1, Section VIII, ASME Code (with 7(b)(2)(i), above), or

(3) Class 1 acceptance criteria of NAVSEA 0900-LP-003-8000, "Surface Inspection Acceptance Standards for Metal," with Change 2, July 1, 1974 (with 7(b)(1)(ii) or 7(b)(2)(ii), above), or

(4) 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 §71.95.

9. Expiration date: May 31, 2002

REFERENCES

For the Model 1 S-6213 PUSC:

U.S. Naval Reactors application dated July 24, 1975.

Supplements dated: June 3, 1977; July 24, 1978; Naval Reactors letter G#C89-2838, dated May 22, 1989; Naval Reactors letter G#C90-03664, dated September 5, 1990; Naval Reactors letter G#92-03563, dated June 17, 1992; and Naval Reactors letter G#C92-03714, dated October 2, 1992; Naval Reactors letter G#97-03425, dated February 7, 1997; and Naval Reactors letter G#C97-03614, dated September 29, 1997.

For the Model 2 S-6213 PUSC:

U.S. Naval Reactors application G#C91-11165, dated December 19, 1991.

Supplements dated: Naval Reactors letter G#92-03563, dated June 17, 1992; and Naval Reactors letter G#C92-03714, dated October 2, 1992; Naval Reactors letter G#97-03425, dated February 7, 1997; and Naval Reactors letter G#C97-03614, dated September 29, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: AUG. 21, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9187	4	USA/9187/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA Inc.
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-indicating 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; 86500-10, Rev. 0; and Amersham Corporation Drawing No. R86591, Rev. A.

(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 (output)

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

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

(a) Each packaging must meet the Acceptance Tests and Maintenance Program in Section 8, of the October 29, 1993, supplement.

(b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7, of the November 24, 1998, supplement.

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, 2003.

REFERENCES

Tech/Ops application dated December 27, 1983.

Amersham Corporation supplements dated: March 15, 1984, November 8, 1988, and August 16, and October 29, 1993, and November 20, 1995.

AEA Technology Supplement dated November 24, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: December 7, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9196	16	USA/9196/AF-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc. application dated February 17, 1999.

c. DOCKET NUMBER 71-9196

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.: UX-30

(2) Description

Overpack for 30-inch enriched uranium hexafluoride (UF_6) cylinders. The overpack is a right circular cylinder constructed of two stainless steel shells with the volume between the shells filled with 6-inch thick foam (7.8 - 9.8 PCF). A stepped and gasketed horizontal joint permits the top half of the overpack to be removed from the base. The package "halves" are secured with ten indexed, cross-locking "ball lock" pins. The overpack is 43.5" in diameter by 96" long. The maximum gross weight of the package is 8270 lbs.

(3) Drawing

The Model No. UX-30 packaging is fabricated in accordance with Chem-Nuclear Systems Inc, Drawing No. C-110-B-57922-0002, Sheets 1 through 3, Rev. 0.

5.(b) Contents

(1) Type and form of material

UF_6 enriched in the U-235 isotope.

(2) Maximum quantity of material per package

(i) Model No. 30B cylinder: 5,020 pounds UF_6 enriched to not more than 5 w/o in the U-235 isotope. The maximum H/U atomic ratio for the UF_6 is 0.088.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 5.0

6. The 30-inch diameter UF_6 cylinder must be fabricated, inspected, tested and maintained in accordance with American National Standard N14.1-1995 or an earlier version of ANSI N14.1 in effect at the time of fabrication. Cylinders must be fabricated in accordance with Section VIII, Division I, of the ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code and be ASME Code stamped.

7. When the optional 4 lid lifting clips are used instead of the top lugs, the top lid (cover) must be lifted with a spreader bar (saddle).

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

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

   (b) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application, as supplemented.

   (c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application, as supplemented.

   (d) Prior to each shipment, the stainless steel components of the packaging must be visually inspected. Packagings in which stainless steel components show pitting, corrosion, cracking, or pinholes are not authorized for transport.

9. The 30-inch diameter UF_6 cylinder valve stem and plug may be tinned with ASTM B32, alloy 50A or Sn50 solder material, or a mixture of alloy 50A or Sn50 with alloy 40A or Sn40A material, provided the mixture has a minimum tin content of 45 percent.

10. The foam and installation of the foam must be in accordance with Chem-Nuclear Systems, Inc. Specification No. ES-M-170, Rev. 0. The foam and installation for packages fabricated before January 1, 1996 must be in accordance with Vectra Specification No. NPI.F12 (Density: 8-9.5).

11. Packages may be marked with Package Identification Number USA/9196/AF until March 31, 2000.

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: February 28, 2001.

REFERENCES

Chem-Nuclear Systems Inc. application dated February 17, 1999.

United States Enrichment Corporation supplement dated April 14, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: March 30, 1999

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9200	9	USA/9200/B(M)F	1	5

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Packaging, Inc., application dated April 6, 1991, as supplemented.

c. DOCKET NUMBER 71-9200

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.: 125-B

(2) Description

A stainless steel and lead shielded shipping cask. The contents are shipped dewatered. The cask is a right circular cylinder, 65.5-inch outer diameter by 207.5-inch length. The cavity dimensions are 51.25-inch diameter by 192.5-inch length. A 1.0-inch thick stainless steel inner shell, 3.88-inch thick lead annulus and 2.0-inch thick stainless steel outer shell, and 7.50-inch thick welded stainless steel bottom plate make up the cask body. A ten gauge stainless steel thermal shield surrounds the cask outer shell with standoff provided by a wire wrap on a 3.3-inch pitch spacing. The outer lid is 7.50-inch thick stainless steel equipped with a 300 psig rupture disc. The seal is provided by 2 Neoprene O-rings secured by 32, 1-1/2-6 UNC closure bolts. A test port is provided between the O-rings. The lid is also provided with a vent port. Protrusions from the outer cask external cylindrical surface include 2 lifting and 4 tie-down trunnions, 1 shear block for fitting to the shipping skid, and 16 impact limiter attachment lugs (8 at each end of the cask). The impact limiters are 120 inches in diameter by 75 inches long fabricated from 1/4-inch thick stainless steel and filled with closed-cell polyurethane foam. Each impact limiter is secured to the cask by 8, 1-1/4-7 UNC bolts necked down to 1 inch. Plastic pipe plugs are provided in each impact limiter. The overall dimensions of the cask with upper and lower impact limiters are 120-inch outer diameter by 279.5-inch length.

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

A separate inner vessel (fuel/canister basket) is positioned within the cask cavity. The inner vessel consists of 7, 14.5-inch ID by 0.38-inch wall pipes with a welded bottom plate and top end fixture plate which provides a 151-inch long cavity for the canisters. The pipe assembly is positioned within a 50.25-inch OD by 1.0-inch thick steel shell with a 2.0-inch thick welded bottom plate. The space between the pipes and steel shell contain stainless steel structural members and solid neutron moderator and absorber. The top of each tube is shielded by a 10-inch thick stainless steel plug. The inner lid is 5.0-inch thick stainless steel equipped with 2, 300 psig rupture discs in series. The lid has 2 Neoprene O-rings and is secured to the inner vessel by 24, 3/4-10 UNC closure bolts. A test port is provided between the O-rings. The lid is also provided with a vent port.

A fuel, filter, or knockout canister is positioned within the inner vessel with canister impact limiters and a top 10.0-inch thick stainless steel shield plug. Each canister is 14.0-inch OD by 150.0-inch long by 0.25-inch wall and contains Boral sheets or B_4C rods. Canister containment is not required with closure provided by welded or bolted plate with 2 or 4 fittings.

The weight of the cask (100,500 pounds), impact limiters (11,700 pounds each), inner vessel (37,000 pounds), canisters (1,046 to 1,440 pounds each), and canister contents (1,500 to 1,894 pounds each) is approximately 181,500 pounds.

(3) Drawings

(i) The packaging is constructed in accordance with Nuclear Packaging Inc., Drawing No. X-101-100, Sheets 1 through 7, Rev. T.

(ii) The canisters are constructed in accordance with Babcock and Wilcox Company Drawing Nos.: 1161299D, Rev. 1; 1161300D, Rev. B1; and 1161301D, Rev. 1.

(b) Contents

(1) Type and form of material

(i) Byproduct and special nuclear material in the form of irradiated fuel particles, partial fuel rods, partial assemblies, and core debris. The maximum pre-irradiation U-235 enrichment must not exceed 2.98 weight percent. The average burnup of the fuel material must not exceed 3,165 MWD/MTU and be cooled for at least 6.0 years.

5.(b)(1) (continued)

(ii) Irradiated core structural components, contaminated defueling equipment, and filter-aid materials.

Except for close fitting contents, dunnage must be provided in the shipping cask cavity sufficient to prevent significant movement of the contents and secondary containers relative to the outer packaging under accident conditions.

(iii) Byproduct and special nuclear material in the form of internal contamination inside the inner vessel. Internal contamination shall not exceed the limits for low specific activity material as defined in 10 CFR §71.4.

(2) Maximum quantity of material per package

Seven fuel, knockout, or filter canisters or any combination thereof within the inner vessel. The radioactive decay heat load must not exceed 100 watts in each canister. The gross weight of each canister must not exceed 2,940 pounds.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. The cask cavity and inner vessel must be dry when delivered to a carrier for transport, except for free water which may be present following drip drying of the canisters for a minimum of 2 minutes after removal from the storage pool. The canisters must be loaded and dewatered in accordance with Section 7.1.1 of the application which includes approximately 2 atm of argon, nitrogen, or helium cover gas. The cask cavity and inner vessel must be filled with argon, nitrogen, or helium at 1.0 atm pressure.

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

(a) Prior to each shipment, the inner and outer lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first; and

(b) Each package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

(c) The package must be prepared for shipment and operated in accordance with Section 7.0 of the application.

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

8. (continued)

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 canister gas void if present at STP (i.e., no more than 0.063 g-moles/ft^3 at 14.7 psia and 70°F); or that oxygen is limited to 5% by volume in those portions of the canister which could have hydrogen greater than 5%.

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

9. Bolt torque:

The outer cask lid must be secured by 32, ASTM A320, Grade L43 (Cadmium plated), 1-1/2-6 UNC-2A x 5.5 long bolts torqued to 780-945 ft-lbs (lubricated).

The inner vessel lid must be secured by 24, ASTM A320, Grade L43 (Cadmium plated), 3/4-10 UNC-2A x 2.25 long bolts torqued to 130-158 ft-lbs (lubricated).

The upper and lower overpack limiters must each be secured by 8, ASTM A320, Grade L43 (Cadmium plated), 1-1/4-7 UNC-2A x 41.75 long bolts torqued to 225-270 ft-lbs (lubricated).

10. Except for the contents specified in 5.(b)(1)(iii), prior to each shipment, the licensee must confirm that the cask and inner vessel are properly sealed by tests as specified in Appendix 7.4 or Section 8.2.2 of the application. The test is satisfied if no leakage is detected using a test with a minimum sensitivity of $1x10^{-3}$ atm-cm^3/s.

11. The neoprene O-ring seals used in the containment vessel closure must be fabricated from neoprene material specified as Cascade Gaskets compound number CG 100-111-60.

12. The licensee may use a tarpaulin to cover the cask during time of transport.

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

14. Effective date: April 1, 1996. Expiration date: April 1, 2001.

REFERENCES

Nuclear Packaging, Inc. application dated April 6, 1991.

Supplements dated: April 9 and 15, 1991; and February 21, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date 3/21/96

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9202	6	USA/9202/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Transnuclear, Inc. application
dated January 19, 1989, as supplemented.

c. DOCKET NUMBER 71-9202

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-BRP

(2) Description

The TN-BRP is a right circular cylindrical cask designed for shipment of up to 44 BWR spent fuel assemblies. The total weight of the package is approximately 215,000 pounds. This includes the payload capacity of 41,250 pounds. The overall dimensions of the package, with impact limiters, are 244.5 inches long by 131 inches diameter. The cask body is 190.5 inches long by 83.25 inches in diameter. The cask has a cylindrical payload cavity which is 171 inches long and 64 inches in diameter. The volume of the cavity is approximately 185 cubic feet.

The containment vessel consists of a 9.62-inch thick forged steel (ASME SA-350; Grade LF3) cylindrical shell, with bottom plate and lid. The bottom plate and lid are made from 9.75-inch thick steel (ASME SA-350, Grade LF3). The 74.75-inch diameter lid is bolted to the cask with forty-eight, 1-5/8-inch diameter steel (ASME SA 540 Grade B24, Class 1) bolts. The cask is sealed with a viton O-ring mounted in a groove machined in the underside of the lid. The containment vessel is provided with access and vent ports in the lid, and two gas sampling ports and a research instrumentation port in the cask body.

The spent fuel assemblies are housed in a specially designed 44 compartment fuel basket. Each compartment can accommodate two BRP fuel assemblies stacked end-to-end. During transport, one-half the compartments are loaded with spent fuel and the remaining with stainless steel inserts. Peripheral inserts fabricated from an aluminum alloy are positioned between the fuel basket and cask cavity wall.

5.(a) Packaging (continued)

(2) Description (continued)

The cask is provided with steel encased balsa-red wood impact limiters. The limiters have an outer diameter of 131 inches, an inner diameter of 91 inches, and a thickness of 20 to 26 inches. Each impact limiter is attached to the cask by four equally spaced 2.25-inch diameter bolts. The impact limiters are also connected to each other with fourteen 1.50-inch diameter tie rods.

The cask has four lifting lugs welded to the lid, and four lifting/ tiedown trunnions bolted to the cask body.

(3) Drawings

(i) The packaging is constructed in accordance with the following Transnuclear, Inc. Drawings:

3024-150-1, Rev. 2	Longitudinal Section
3024-150-2, Rev. 4	Transverse Section
3024-150-3, Rev. 2	Shell and Bottom
3024-150-4, Rev. 2	Lid
3024-150-5, Rev. 3	Trunnion
3024-150-6, Rev. 4	Front Impact Limiter
3024-150-7, Rev. 3	Rear Impact Limiter
3024-150-11, Rev. 1	Packaging Penetrations
3024-150-12, Rev. 3	Lid Bolt
3024-150-13, Rev. 2	Parts List
3024-150-14, Rev. 2	Trunnion Shoulder Bolt
3024-150-16, Rev. 0	Impact Limiter Spacers
3024-150-19, Rev. 0	Tierods & Tierod Brackets
3024-150-26, Rev. 0	Front Impact Limiter & Tierod Bracket Assembly
3024-150-27, Rev. 0	Rear Impact Limiter & Tierod Bracket Assembly
3024-150-31, Rev. 0	Attachment Bolt
3024-150-32, Rev. 0	Disc Spring

(ii) The fuel assembly basket is constructed in accordance with the following Transnuclear, Inc. Drawings:

3024-150-8, Rev. 1	Basket General Arrangement
3024-150-9, Rev. 0	Basket Cross Section
3024-150-10, Rev. 1	Basket Plane View
3024-150-15, Rev. 0	Type A and B Spacers
3024-150-17, Rev. 2	Basket Peripheral Inserts
3042-150-18, Rev. 2	Fuel Replacement Inserts

5.(b) Contents

(1) Type and form of material

(i) Irradiated BWR uranium oxide fuel assemblies as described in the application and including the following specifications:

Assembly Type	Array	Pellet dia. (in.)	Clad Thickness	Rod OD (in.)	Pitch (in)	Mass (U) Kg
B	11x11	0.275/0.373	0.034	0.344/0.449	0.577	132
C	11x11	0.275/0.373	0.034	0.344/0.449	0.577	121
D	7x7	0.620	0.040	0.700	0.921	133
D	8x8	0.500	0.035	0.570	0.807	113
E	9x9	0.471	0.040	0.562	0.707	141
F	9x9	0.471	0.040	0.562	0.707	137
D(EG)	9x9	0.471	0.040	0.562	0.707	136
EP	9x9	0.471	0.040	0.562	0.707	118

The BWR fuel assemblies have a maximum burnup of 25,000 MWD/MTU.
The minimum cooling time for any assembly is fourteen years.

(2) Maximum quantity of material per package

(i) Forty-four BWR assemblies.

(ii) Maximum decay heat per package not to exceed 3.1 kilowatts.
Maximum 103 watts per BWR assembly.

(iii) Above fuel assemblies to be positioned in the fuel baskets as shown in the drawings referenced in 5(a)(3)(ii).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on
label for nuclear criticality control: 100

6. Shipments must be completed between April 1 and October 31.

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

a. The packaging must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application.

b. The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

c. The packaging must be loaded in accordance with Section 7.1.2.19 and Chapter 1 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: June 30, 2004.

REFERENCES

Transnuclear Inc. application dated January 19, 1989.

Supplements dated: March 22, 1989; December 19, 1990; March 4 and October 3, 1991; April 21 and November 7, 1994, and April 27, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date 6/18/99

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9203	10	USA/9203/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Framatome Cogema Fuels
P.O. Box 11646
Lynchburg, VA 24506-1646

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Framatome Cogema Fuels application dated May 31, 1996, as supplemented.

c. DOCKET NUMBER 71-9203

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.: DHTF

(2) Description

The packaging consists of a 14-gauge stainless steel containment vessel, 9.5 inches by 9.5 inches by 17.5 inches high, with a bolted and gasketed top flange closure and stainless steel welded bottom plate. The containment vessel is centered and supported in a steel drum by industrial cane fiberboard of 16.5 ± 2 lbs/ft^3 density.

Closure of the containment vessel is maintained by a 3/8-inch thick carbon steel lid and 1/8-inch thick silicone rubber gasket secured with eight, 3/8-16NC by 1-1/2 long hex bolts and nuts. The 16-gauge steel outer drum is approximately 34 inches high and 22.5 inches in diameter. The drum closure is a 16-gauge lid 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 490 pounds.

(3) Drawings

The packaging is constructed and assembled in accordance with Framatome Cogema Fuels Drawing Nos. 1249874E, Rev. 3; 1259100C, Rev. 0; 1259101C, Rev. 0; and 1215600D, Rev. 6; except that the torque for the drum closure ring bolt must be in accordance with Condition No. 10 of this certificate.

5.(b) Contents

(1) Type and form of material

Dry uranium oxide solid pellets, annular pellets, or scrap, packaged either on trays or bagged, as shown in Framatome Cogema Fuels 1215600D, Rev. 6.

(i) Solid pellets on stainless steel trays. The minimum pellet diameter is 0.315 inch and the maximum pellet diameter is 0.4075 inch.

(ii) Bagged solid pellets or scrap, or any combination. The maximum pellet diameter is 0.4075 inch.

(iii) Bagged solid pellets or scrap, or any combination. The maximum pellet diameter is 0.375 inch.

(iv) Bagged annular pellets. The minimum pellet diameter is 0.291 inch and the maximum pellet diameter is 0.304 inch, with an annulus from 0.045 to 0.065 inch in diameter.

(2) Maximum quantity of material per package

The maximum weight of contents and all packaging materials within the inner container is 275 lbs. The maximum quantity of polyethylene is 149 grams per pellet box.

(i) For the contents described in Item 5(b)(1)(i), enrichment and fissile quantities are limited as follows:

Max. Enrichment (wt % U-235)	Max. UO_2 mass (kg)	Max. U-235 mass (kg)	Max. Number Pellet Boxes
5.0	112	4.83	4

(ii) For the contents described in Item 5(b)(1)(ii), enrichment and fissile quantities are limited as follows:

Max. Enrichment (wt % U-235)	Max. UO_2 mass (kg)	Max. U-235 mass (kg)	Max. Number Pellet Boxes
5.0	84	3.62	3

(iii) For the contents described in Item 5(b)(1)(iii), enrichment and fissile quantities are limited as follows:

Max. Enrichment (wt % U-235)	Max. UO_2 mass (kg)	Max. U-235 mass (kg)	Max. Number Pellet Boxes
3.85	112	3.72	4

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

(iv) For the contents described in Item 5(b)(1)(iv), enrichment and fissile quantities are limited as follows:

Max. Enrichment (wt % U-235)	Max. UO_2 mass (kg)	Max. U-235 mass (kg)	Max. Number Pellet Boxes
5.0	84	3.55	3
3.75	112	3.55	4

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 1.2

6. Each package must have a stainless steel plate (spacer) positioned between pellet boxes, as shown on Framatome Cogema Fuels Drawing No. 1249874E, Rev. 3.

7. For packages containing fewer than four loaded pellet boxes, solid aluminum spacer blocks, as shown on Framatome Cogema Fuels Drawing No. 1259100C, Rev. 0, must be substituted for all missing boxes.

8. For contents described in Item 5(b)(1)(i) and limited in Item 5(b)(2)(i), stainless steel trays must be positioned between each layer of pellets, and on the top and bottom of the pellet stack. Additional trays must be inserted in partially filled pellet boxes to provide a snug fit.

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

(a) Prior to each shipment the containment vessel gasket must be inspected. The gasket must be replaced if the inspection shows any defects or signs of degradation.

(b) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application.

(c) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application, as supplemented October 29, 1999.

10. The eight, 3/8-inch containment vessel bolts must be torqued to 35 ft-lbs ± 10% and the 5/8-inch closure ring bolt and lock nut must be torqued to 70 ft-lbs ± 10%. Immediately following each loading of a package, the closure ring must be inspected to assure it is fully seated (engaged).

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: January 31, 2001.

REFERENCES

Framatome Cogema Fuels application dated May 31, 1996.

Supplements dated: August 15, and September 9 and 10, 1996; September 26 and October 9, 1997; March 5, April 28, and May 8, 1998; and October 29, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: November 5, 1999

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9204	5	USA/9204/B(U)-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Chem-Nuclear Systems, LLC
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, LLC, application dated March 22, 2000.

c. DOCKET NUMBER 71-9204

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 10-160B

(2) Description

A cylindrical carbon steel and lead shielded shipping cask, designed to transport radioactive waste material. The cask is transported in the upright position and is equipped with steel encased, rigid polyurethane foam impact limiters on the top and bottom. The package has approximate dimensions, shielding, and weight as follows:

Cask height	88 inches
Cask outer diameter	78-1/2 inches
Cask cavity height	77 inches
Cask cavity diameter	68 inches
Overall package height, with impact limiters	130 inches
Overall package diameter, with impact limiters	102 inches
Lead shielding thickness	1-7/8 inches
Gross weight (packaging and contents)	72,000 lbs
Maximum total weight of contents, shoring, secondary containers, and optional shield insert	14,500 lbs

The cask body consists of a 1-1/8-inch thick carbon steel (ASME SA516 or SA537) inner shell, a 1-7/8-inch thick lead gamma shield, and a 2-inch thick carbon steel outer shell (ASME SA516). The inner and outer shells are welded to a 5-1/2-inch thick carbon steel bottom plate. The cask cavity has an optional 11-gage stainless steel liner. A 12-gage stainless steel thermal shield surrounds the cask outer shell in the region between the impact limiters. The impact limiters are secured to each other around the cask by eight ratchet binders.

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

The cask lid is a 5-1/2-inch thick carbon steel plate, and has a 31-inch diameter opening equipped with a secondary lid. The primary lid is sealed with a double silicone O-ring and 24 equally spaced 1-3/4-inch diameter bolts. The secondary lid is 46 inches in diameter, is centered within the primary lid, and is sealed to the primary lid by a double silicone O-ring and 12 equally spaced 1-3/4-inch diameter bolts. The space between the double O-ring seals is provided with a test port for leak testing the primary and secondary lid seals.

The optional cask drain and vent ports are sealed with a plug and an O-ring seal.

The package is equipped with four tie-down lugs welded to the cask outer shell. Two lifting lugs and two redundant lifting lugs are removed during transport. The lid is equipped with three lifting lugs which are covered by the top impact limiter and rain cover during transport.

An optional carbon steel shield insert may be used within the cask cavity.

(3) Drawings

The packaging is constructed and assembled in accordance with Chem-Nuclear Systems Drawing No. C-110-D-29003-010, Sheets 1 through 5, Rev. 10.

An optional shield insert is constructed in accordance with Chem-Nuclear Systems Drawing No. C-119-B-0018, Rev. 1.

(b) Contents

(1) Type and form of material

(i) Byproduct or source material in the form of solids, dewatered resins or process solids, or solidified waste, contained within secondary containers; or

(ii) Radioactive material in the form of activated reactor components.

(2) Maximum quantity of material per package

Type B quantity of radioactive material, not to exceed 2,000 times a Type A quantity. Decay heat not to exceed 100 watts. Total weight of contents, shoring, secondary containers, and optional shield insert not to exceed 14,500 pounds. Contents may include fissile material contaminants provided the mass limits of 10 CFR §71.53 are not exceeded. Plutonium content not to exceed 0.74 TBq (20 curies).

6. Except for close fitting contents, shoring must be placed between the secondary containers or activated components and the cask cavity to prevent movement during accident conditions of transport.

7. The cask primary lid must be secured by 24, and the secondary lid by 12, 1-3/4"-8UNC x 5-3/8" long hex cap screws with a flat washer, torqued to 300 ft-lbs ± 30 ft-lbs (lubricated). The optional drain and vent port plugs must be torqued to 20 ± 2 ft-lbs.

8. Lift lugs must be removed from the cask body prior to transport.

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

   (a) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application; and

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

   (c) The primary lid, secondary lid, and the optional vent and drain seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first.

10. The package must be leak tested as follows:

   (a) Prior to each shipment, the package must be leak-tested in accordance with Section 8.2.2.2 of the application. For contents that meet the definition of low specific activity material or surface contaminated objects in 10 CFR §71.4, and also meet the exemption standard for low specific activity material and surface contaminated objects in 10 CFR §71.10(b)(2), the pre-shipment leak-test is not required.

   (b) The packaging containment system must be leak tested in accordance with Section 8.1.3 of the application prior to first use of any packaging, after the third use, within the twelve month period prior to each use, and after seal replacement.

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

   (1) 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/ft^3 at 14.7 psia and 70°F); or

   (2) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen is 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 a 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.

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: October 31, 2005.

REFERENCES

Chem-Nuclear Systems, LLC, application dated March 22, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: May 12, 2000

NRC FORM 618
(3-86)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9206	6	USA/9206/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

U. S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Transnuclear, Inc. application dated September 1, 1989, as supplemented

c. DOCKET NUMBER 71-9206

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-REG

(2) Description

The TN-REG package is a cylindrical steel cask designed for shipment of up to 20 PWR spent fuel assemblies. The package, with impact limiters attached, is approximately 234 inches long and 131 inches in diameter. The total weight of the package is about 225,000 pounds. The maximum weight of the contents, including the fuel basket assembly, is approximately 50,500 pounds. The cask is transported in a horizontal orientation on a specially designed shipping frame.

The containment vessel consists of a 9.25-inch thick forged steel (ASME SA-350) cylindrical shell and lid. The lid is approximately 82.25 inches in diameter and has a maximum thickness of 8.5 inches. The lid is bolted to the cask with forty-eight 1-5/8 inch steel (ASME SA-540, Grade B24, Class 1) bolts. The cask is sealed with a Viton O-ring mounted in a groove machined in the underside of the lid. A second metallic O-ring is provided to leak test the Viton O-ring. The cask is provided with access and vent ports in the lid, and two gas sampling ports and a research instrumentation port in the cask body. All five of these penetrations are sealed using Viton O-rings.

The spent fuel assemblies are positioned within a 40 compartment fuel basket. Each compartment can accommodate a single PWR assembly. During transport, the 40 compartments are loaded in a checkerboard fashion with spent fuel and hollow stainless steel fuel replacement inserts in alternating compartments, resulting in a maximum loading of 20 spent fuel assemblies. Peripheral inserts fabricated from an aluminum alloy are positioned between the fuel basket and cask cavity wall.

5.(a)(2) Continued

The cask is equipped with impact limiters made of balsa and redwood encased in carbon steel shells. The impact limiters have an outer diameter of 131 inches, an inner diameter of 91 inches, and a thickness ranging from 20 to 26 inches. Each impact limiter is attached to the cask by four 2.25-inch diameter bolts. The impact limiters are also connected to each other with fourteen 1.5-inch diameter tie rods.

The cask has four lifting lugs welded to the lid, and four lifting/tie down trunnions bolted to the cask body.

(3) Drawings

(i) The packaging is constructed in accordance with the following Transnuclear, Inc. Drawings:

3024-150-6, Rev. 4	Front Impact Limiter
3024-150-7, Rev. 3	Rear Impact Limiter
3024-150-11, Rev. 2	Packaging Penetrations
3024-150-12, Rev. 3	Lid Bolt
3024-150-19, Rev. 0	Tie Rods and Tie Road Brackets
3024-150-21, Rev. 1	Longitudinal Section
3024-150-22, Rev. 2	Transverse Sections
3024-150-23, Rev. 1	Shell and Bottom
3024-150-24, Rev. 1	Lid
3024-150-25, Rev. 1	Trunnion
3024-150-26, Rev. 0	Front Impact Limiter and Tie Rod Bracket Assembly
3024-150-27, Rev. 0	Rear Impact Limiter and Tie Rod Bracket Assembly
3024-150-31, Rev. 0	Impact Limiter Attachment Bolt
3024-150-32, Rev. 0	Disc Spring at Impact Limiter
3024-150-33, Rev. 1	Parts List
3024-150-36, Rev. 0	Impact Limiter Front Spacer

(ii) The fuel basket assembly is constructed in accordance with the following Transnuclear Drawings:

3024-150-28, Rev. 0	Basket-General Arrangement
3024-150-29, Rev. 0	Basket-Cross Section
3024-150-30, Rev. 0	Basket-Plan View
3024-150-37, Rev. 1	Peripheral Insert
3024-150-38, Rev. 0	Fuel Replacement Insert

5.(b) Contents

(1) Type and form of material

(i) Irradiated PWR uranium oxide fuel assemblies as described in the application and including the following specifications:

Fuel form	UO_2 pellets
Nominal pellet diameter	0.367 inch
Cladding material	Zircaloy
Cladding thickness	0.024 inch
Maximum fuel rod length	162 inches
Maximum active fuel rod length	144 inches
Assembly array	14 x 14
Maximum initial fuel pin pressure at 70°F	1 atm
Maximum initial U^{235} enrichment	3.5% w/o
Initial uranium loading	383 kg

The PWR fuel assemblies have a maximum burnup of 15,000 MWD/MTU. The minimum cooling time for any assembly is 17 years.

(2) Maximum quantity of material per package

(i) Maximum of twenty PWR fuel assemblies.

(ii) Maximum decay heat per package not to exceed 2.7 kilowatts. Maximum 135 watts per PWR assembly.

(iii) Above fuel assemblies to be positioned in the fuel baskets as shown in the drawings referenced in 5(a)(3)(i).

(3) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Shipments must be completed between April 1 and October 31.

7. Bolt torques:

(a) The cask lid bolts must be torqued to 1120 ft-lbs.

(b) The bolts used to secure the vent and drain port covers must be torqued to 50 ft-lbs.

(c) The bolts used to secure the upper gas sampling port transport plug must be torqued to 30 ft-lbs.

(d) The bolts used to secure the lower gas sampling port cover and port transport plug must be torqued to 15 ft-lbs.

8. Known or suspected fuel assemblies (rods) with cladding defects greater than pin hole leaks or hairline cracks are not authorized.

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

   (a) Each packaging must be prepared for shipment and operated in accordance with the operating procedures in Chapter 7 of the application. After loading, the cask must be vacuum dried and backfilled with nitrogen at one atmosphere as described in Chapter 7 of the application.

   (b) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

   (c) The packaging must be loaded in accordance with Section 7.1.2.19 of the application.

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, 2005.

REFERENCES

Transnuclear, Inc. application dated September 1, 1989.

Supplements dated: March 7 and October 22, 1990; January 7 and February 11, 1991; November 7, 1994; March 2 and 15, 1995; February 8, 1999; and March 30, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date May 26, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9208	11	USA/9208/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

ATG Nuclear Services, LLC
669 Emory Valley Road
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NuPac Services, Inc., application dated April 17, 1991, as supplemented.

c. DOCKET NUMBER 71-9208

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.: 10-142

(2) Description

Steel encased, lead shielded cask for solid radioactive material. The overall dimensions of the cask and impact limiters are 112-inch diameter by 130-inch height. The cask consists of two concentric carbon steel cylindrical shells surrounding a 3-1/2-inch thick lead shield. The ½-inch thick inner shell has a 66-inch ID, and the 1-inch thick outer shell has a 76-inch OD; The base consists of two, 3-inch thick welded steel plates of 66- and 74-inch diameters. The base is welded to the steel cylindrical shells. A stepped welded lid, secured by 16, 1-1/2-6 UNC-2A studs and nuts, is comprised of two, 3-inch thick steel plates containing an opening for a secondary lid of similar construction with one additional 1-inch thick upper plate. Within the primary lid there is a 16-inch or 29-inch centered secondary lid. The 16-inch lid is secured by 8, 7/8-inch studs and nuts and the 29-inch lid is secured by 16, 1-1/4-inch studs and nuts. The lids are sealed with a solid silicone flat gasket. The containment cavity is 66 inches in diameter by 72 inches high. A plugged drain port is located at the cask bottom and the lid is provided with a plugged test port. 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 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.

All exposed side walls are 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 68,000 pounds.

(3) Drawings

The Model No. 10-142 packaging is fabricated in accordance with Nuclear Packaging, Inc., Drawing No. X-103-110-SP, Sheets 1 through 5, Rev. H.

(b) Contents

(1) Type and form of material

(i) Dewatered, solid, or solidified waste which may be in secondary containers;

(ii) Activated components which may be in secondary containers; or

(iii) Dewatered, solid or solidified material, meeting the requirements for low specific activity material, which may be in secondary containers.

(iv) Dewatered or solidified ion exchange resin from light water reactors, in secondary containers.

(2) Maximum quantity of material per package

Decay heat not to exceed 400 watts. Fissile materials not to exceed the limits of 10 CFR §71.53. Maximum weight of contents, including dunnage and secondary containers, not to exceed 10,000 pounds.

For the contents specified in 5(b)(1)(i) and 5(b)(1)(ii):

Not to exceed a Type A quantity of transuranic materials.

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 or by analysis 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 not 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/ft^3 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 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 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 normal condition.

8. Bolt Torque:

   The primary cask lid studs and nuts must be torqued to 300 ± 25 ft-lbs (lubricated).

   The secondary cask lid studs and nuts must be torqued to 200 ± 10 ft-lbs (lubricated).

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

   a. Prior to each shipment, the packaging seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first. Cavity drain and test ports must be sealed with appropriate sealant applied to the pipe plug threads. The cask must be leak tested in accordance with the supplement dated November 24, 1992.

   b. The package must be prepared for shipment and operated in accordance with the operating procedures in Section 7.0 of the application; except that the cask shall be leak tested in accordance with the supplement dated November 24, 1992.

   c. Each package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application; except that the cask shall be leak tested in accordance with the supplement dated November 24, 1992.

   d. For contents that meet the definition of low specific activity material or surface contaminated objects in 10 CFR §71.4, and also meet the exemption standard for low specific activity material and surface contaminated objects in10 CFR §71.10(b)(2), the pre-shipment leak test is not required.

10. Use of intumescent coating fire shield 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: July 31, 2001.

REFERENCES

Nuclear Packaging, Inc., application dated April 17, 1991.

Supplements dated: May 24, 1991; November 24, 1992; May 19, 1993; January 20, 1994; May 16, 1996; and August 5, 1997.

ATG Nuclear Services, LLC, supplements dated: December 1, 1998; and August 9 and 11, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 1/11/00

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9210	5	USA/9210/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

ATG Nuclear Services, LLC
669 Emory Valley Road
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Scientific Ecology Group, Inc., application dated October 26, 1993, as supplemented.

c. DOCKET NUMBER 71-9210

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.: 10-135B

(2) Description

Steel encased, lead shielded cask for solid radioactive material. The overall dimensions of the cask are 112-inch diameter by 130-inch height. The cask consists of two concentric carbon steel cylindrical shells surrounding a 3-1/2-inch thick lead shield. The ½-inch thick inner shell has a 66-inch ID, and the 1-inch thick outer shell has a 76-inch OD; the base consists of two, 3-inch thick welded steel plates of 66- and 74-inch diameters. The base is welded to the steel cylindrical shells by a combination of fillet and full penetration groove welds. The top of the cask is provided with a primary lid and a secondary lid. The primary lid is of a stepped construction which is made of two, 3-inch thick steel plates of 76-inch diameter and 66-inch diameter joined together to form an integral 6-inch thick lid. The primary lid is secured to the cask body through 16, 1-1/2 - 6 UNC high strength bolts. The secondary lid which covers the 29-inch diameter hole at the center of the primary lid is also of stepped construction consisting of two, 3-inch thick plates. The secondary lid is secured to the primary lid through 16, 1-1/4 - 7 UNC high strength bolts. High temperature silicone gaskets are provided at the cask-primary lid and the primary lid-secondary lid interfaces. The latter is also provided with an additional Neoprene seal.

Two impact limiters are located at the top and bottom of the cask. The impact limiters are 10-gauge stainless steel shells filled with rigid polyurethane. The inner surfaces of the cask and the lid are clad with 12-gauge 304-stainless steel. The portion of the cask body that is not covered by the impact limiters is covered with a 10-gauge 304-stainless steel thermal shield. There is a 1/4-inch gap between the shell and the thermal shield which is maintained using 1/4-inch spacers.

The package gross weight is limited to 68,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Scientific Ecology Group, Inc., Drawing No. STD-02-106, Sheets 1 and 2, Rev. 1.

(b) Contents

(1) Type and form of material:

(i) Dewatered, solid, or solidified waste in secondary containers;

(ii) Activated solid components in secondary containers; or

(iii) Dewatered or solidified ion exchange resins from light water reactors, in secondary containers.

(2) Maximum quantity of material per package:

Greater than Type A quantities of radioactive materials which may contain fissile quantities limited to the amounts as exempted under 10 CFR §71.53. Not to exceed a Type A quantity of transuranic materials except for the contents specified in 5(b)(1)(iii) and materials of low specific activity. Internal decay heat not to exceed 400 watts and the maximum weight of contents including 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 or by analysis of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(1) 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/ft^3 at 14.7 psia and 70°F); or

(2) 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) does not apply.

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

(a) The package must meet the Acceptance Test and Maintenance Program of Section 8.0 of the application, as supplemented.

(b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application, as supplemented.

8. The containment vessel must be leak tested to 1.3×10^{-6} atm-cm^3/sec (at the standard conditions of ANSI N14.5):

   (a) Prior to the first use of each package;

   (b) After the package's third use;

   (c) Within twelve months of the last leak test; and

   (d) Whenever gaskets are replaced.

9. Prior to each shipment, the containment system shall be leak tested to 5.0×10^{-3} atm-cm^3/sec (at the standard conditions of ANSI N14.5) to verify that it has been properly assembled. For contents that meet the definition of low specific activity material or surface contaminated objects in 10 CFR §71.4, and also meet the exemption standard for low specific activity material and surface contaminated objects in 10 CFR §71.10(b)(2), the pre-shipment leak test is not required.

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: January 31, 2005

REFERENCES

Scientific Ecology Group, Inc., application dated October 26, 1993.

Supplements dated: April 5 and October 31, 1994.

Molten Metal Technology, Inc., supplement dated February 24, 1998.

ATG Nuclear Services, LLC, supplements dated: December 1, 1998; August 9 and 11, 1999; and November 30, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: February 4, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9212	0	USA/9212/B(M)F-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation application dated December 20, 1996, as supplemented.

c. DOCKET NUMBER 71-9212

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: RH-TRU 72-B

(2) Description

A stainless steel, lead-shielded cask designed to provide double containment for shipment of transuranic waste materials. The packaging consists of a cylindrical stainless steel and lead cask body, a separate inner stainless steel vessel, and foam-filled impact limiters at each end of the cask body.

The cask body (outer cask) consists of a 1 1/2-inch thick, 41 1/8-inch outer diameter stainless steel outer shell, and a 1-inch thick, 32 3/8-inch inside diameter stainless steel inner shell, with 1 7/8 inches of lead shielding between the two shells. The cask bottom is 5-inch thick stainless steel plate. The cask is closed by a 6-inch thick stainless steel lid, and 18, 1 1/4-inch diameter bolts. The main closure lid has a double bore-type O-ring seal. The containment seal is the inner butyl O-ring seal, which is leak testable. The cask lid has a single vent/sampling port that is sealed with leak testable butyl O-ring seals.

The separate inner vessel consists of a 3/8-inch thick, 32-inch outside diameter stainless steel shell, and a 1 1/2-inch thick stainless steel bottom plate. The inner vessel is closed by a 6 1/2-inch thick stainless steel lid, and eight, 7/8-inch diameter bolts. The inner vessel closure lid has three bore-type O-ring seals. The containment seal is the middle butyl O-ring seal, which is leak testable. The inner vessel lid has a helium backfill port and a combination vent/sampling port that are sealed with leak-testable butyl O-ring seals.

A polyurethane foam-filled stainless steel impact limiter is attached to each end of the cask body using six, 1 1/4-inch diameter bolts. The radioactive contents are packaged within a carbon steel waste canister that is placed in the inner vessel.

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

The approximate dimensions and weights of the package are as follows:

Overall package length	187 3/4 inches
Impact limiter diameter	76 inches
Cask length	141 3/4 inches
Cask outer diameter (OD)	41 1/8 inches
Inner vessel length	130 3/4 inches
Inner vessel OD	32 inches
Cask lead shield thickness	1 7/8 inches
Maximum package weight (including contents)	45,000 pounds
Maximum weight of contents (including waste canister)	8,000 pounds

(3) Drawings

The packaging is constructed and assembled in accordance with Westinghouse Electric Company Drawing No. X-106-500-SNP, Sheets 1-9, Rev. 1.

The carbon steel waste canister is constructed and assembled in accordance with Westinghouse Electric Company Drawing No. X-106-501-SNP, Rev. 1.

(b) Contents

(1) Type and form of material

Byproduct, source, and special nuclear material in the form of dewatered, solid or solidified materials and waste, within the carbon steel waste canister described in Item 5(a)(3). Explosives, corrosives (pH less than 2 or greater than 12.5), nonradioactive pyrophorics, and compressed gases are prohibited. Within a waste canister radioactive pyrophorics must not exceed 1 weight percent. Flammable volatile organics are limited to 500 ppm in the headspace of the waste canister.

(2) Maximum quantity of material per package.

Not to exceed 8,000 pounds, including the weight of the waste canister.

Fissile material not to exceed 325 grams Pu-239 equivalent. Pu-239 equivalent is determined in accordance with Sections 9.0 of Appendix 1.3.7 of the application, "Isotopic Characterization and Fissile Content."

Maximum decay heat per package not to exceed 50 watts, and not to exceed the limits in Section 1.2.3 of the application, "Contents of Packaging."

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.0

6. Waste content codes and classification, physical form, chemical properties, chemical compatibility, gas generation, fissile content, decay heat, isotopic inventory, weight, and radiation dose rate must be determined and limited in accordance with Appendix 1.3.7 of the application "Remote-Handled Transuranic Waste Authorized Methods for Payload Control (RH-TRAMPAC)."

7. Each waste canister must not exceed the decay heat limits in Section 1.2.3 of the application, or must be tested for gas generation in accordance with Appendix 1.3.7 of the application, Section 10.0, "Decay Heat and Hydrogen Generation Rate Limits."

8. One or more filter vents must be installed in the waste canister and any sealed secondary containers overpacked in the waste canister. Filter vents must meet the minimum specifications in Appendix 1.3.5 of the application "Specification for Filter Vents." Containers which were not equipped with filter vents during storage must be aspirated in accordance with Appendix 1.3.7 of the application, Section 8.1.3 "Venting and Aspiration."

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

   (a) Each package must be prepared for shipment and operated in accordance with the procedures described in Chapter 7.0, "Operating Procedures," of the application, as supplemented.

   (b) Each packaging must be tested and maintained in accordance with the procedures described in Chapter 8.0, "Acceptance Tests and Maintenance Program," of the application, as supplemented.

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, 2005.

REFERENCES

Westinghouse Electric Corporation, application dated December 20, 1996.

Supplements dated: March 26 and August 23, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date March 3, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9215	5	USA/9215/B(U)	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Neutron Products, Inc.
22301 Mt. Ephraim Road
P.O. Box 68
Dickerson, MD 20842

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Neutron Products, Inc. application dated September 14, 1992, as supplemented.

c. DOCKET NUMBER 71-9215

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 MkII

(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 3/16-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) Drawings

The Model No. NPI-20WC-6 MkII packaging is constructed in accordance with Neutron Products, Inc. Drawing Nos. 240116, Rev. D, and 240122, Sheet 1 of 2, Rev. G, Sheet 2 of 2, Rev. -.

(b) Contents

(1) Type and form of material

Cobalt-60 as sealed sources which meet the requirements of special form radioactive material.

(b) Contents (Continued)

(2) Maximum quantity of material per package

(i) For sources contained within drum assembly shown as Item 5 on Neutron Products, Inc. Drawing No. 240122, Sheet 1 of 2, Rev. G:

Maximum activity not to exceed 15,000 curies, maximum decay heat not to exceed 240 watts.

(ii) For sources contained within drum assembly shown as Item 4 on Neutron Products, Inc. Drawing No. 240122, Sheet 2 of 2, Rev. -:

Maximum activity not to exceed 9,500 curies, maximum decay heat not to exceed 150 watts.

(iii) For sources contained within drum assembly shown as Item 2 on Neutron Products, Inc. Drawing No. 240122, Sheet 2 of 2, Rev. -:

Maximum activity not to exceed 6,300 curies, maximum decay heat not to exceed 100 watts.

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

(a) The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

(b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application.

7. The contents must be secured in the drum assembly so as to restrict movement in any direction to less than 0.25 inch, by lead, steel, or tungsten full diameter plugs and spacers.

8. The gross weight of the package must not exceed 6,000 pounds, and the inner shield cask shall be snug-fitting with the wooden overpack.

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: October 31, 2002.

REFERENCES

Neutron Products, Incorporated application dated September 14, 1992.

Supplements dated: October 29, 1992; November 17, 1993; and September 8, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: 10/30/97

NRC FORM 618
(3-96)
10 CFR 71

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
9216	6	USA/9216/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Inc. application dated November 24, 1987, as supplemented.

c. DOCKET NUMBER 71-9216

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 1-13G

(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	81.8
Protective jacket width, in	68.0
Packaging weight, lb	25,500

(3) Drawings

The packaging is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing Nos.: C-110-B-06402-001, Rev. A; C-110-B-06402-002, Rev. 2; C-110-B-06402-003, Rev. 4; and C-110-B-06402-004, Rev. A.

5. (b) Contents

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

Plutonium in excess of 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) Process solids, either dewatered, solid, or solidified in a secondary sealed container meeting the requirements for low specific activity radioactive material. Fissile materials must meet the exemption standards in 10 CFR §71.53.

(v) 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).

(vi) 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 D of the application. 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.

5. (c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For contents described and limited in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), and 5(b)(1)(vi): 62.5

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. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements or by analysis 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/ft^3 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.

8. 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.

9. 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.

10. 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. B is authorized. The inner container must be provided with vent and drain lines.

11. Shoring must be provided to minimize movement of contents during accident conditions of transport.

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

    (a) The package shall be prepared for shipment and operated in accordance with Chem-Nuclear Systems, Inc. Operating Procedures, Section 7.0.

    (b) 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.

    (c) Prior to each shipment the baseplate to cask shell weld must be visually inspected in accordance with Chem-Nuclear Systems, Inc. Operating Procedures, Section 7.0.

    (d) The packaging must meet Chem-Nuclear Systems, Inc. Acceptance Tests and Maintenance Program, Section 8.0.

13. For packaging of neutron sources, 50 times measured neutron dose rate at one meter from the surface of a cask must be less than 1,000 mrem/hr.

14. The contents described in 5(b)(1)(iv) 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.

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

16. Expiration date: December 31, 2002.

REFERENCES

Chem-Nuclear Systems, Inc. application dated November 24, 1987.

Supplement dated: November 24, 1992, October 31, 1997 and March 31, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges

for

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

Date 10/19/99

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9217	9	USA/9217/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Siemens Power Corporation
2101 Horn Rapids Road
Richland, WA 99352-0130

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Siemens Power Corporation application dated January 26, 2000.

c. DOCKET NUMBER 71-9217

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.: ANF-250

(2) Description

A uranium oxide powder/pellet shipping container. The packaging consists of a 16-gauge steel inner vessel, approximately 11-1/2 inches ID by 57 inches long, with a bolted and gasketed top flange closure and steel welded bottom plate. The inner vessel is centered and supported in a 22-1/2-inch ID by 68-3/8-inch long, 16-gauge steel drum by twelve 1/4-inch diameter spring steel rods welded to the inner vessel at the top and the bottom of the vessel. A 3/8-inch thick steel flange and a 16-gauge inner band position and support the top of the inner vessel within the outer container. The annulus between the inner vessel and outer container is filled with vermiculite.

The inner vessel is closed by six 1/2-inch square shank studs with hex head nuts at each end. The outer container is closed with a 12-gauge locking ring with drop forged lugs and a 5/8-inch diameter bolt and lock nut. A product container insert is positioned within the inner vessel.

The maximum gross weight of the packaging and contents is 616 pounds.

(3) Drawings

(i) The ANF-250 shipping container is constructed in accordance with Siemens Power Corporation Drawing No. EMF-306,175, Rev. 16.

(ii) The pellet shipping suit case is constructed in accordance with Siemens Power Corporation Drawing No. EMF-304,306, Rev. 8.

(iii) The powder and pellet product container inserts are constructed in accordance with Siemens Power Corporation Drawing No. EMF-306,176, Rev. 5, Sheets 1 and 2.

5.(b) Contents

(1) Type and form of material

(i) Dry uranium oxide powder enriched to a maximum 5.0 w/o in the U-235 isotope.

(ii) Dry uranium oxide pellets enriched to a maximum 5.0 w/o in the U-235 isotope.

(iii) Uranium oxide pellets enriched to a maximum of 1 w/o in the U-235 isotope.

(iv) Uranium oxide powder enriched to a maximum of 1 w/o in the U-235 isotope.

(2) Maximum quantity of material per package:

Not to exceed 310 pounds and:

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

The contents not to exceed the following:

Maximum Enrichment (wt% U-235)	Maximum Uranium Mass (kg U)	Maximum U-235 Mass (kg U-235)
3.4	62.4	2.12
3.8	41.0	1.56
4.6	31.2	1.44
5.0	27.7	1.38

Not to exceed a maximum mass of 1149 g H, considering all sources of hydrogenous material within the inner vessel. The contents must be contained in product container described in 5(a)(3)(ii).

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

The total contents not to exceed 120 kg U, with the U-235 content not to exceed 6 kg. Not to exceed a maximum mass of 1149 g H, including a maximum mass of 600 g polyethylene, considering all sources of hydrogenous material within the inner vessel. The contents must be contained in product container described in 5(a)(3)(iii).

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

The total contents not to exceed 120 kg U, with the U-235 content not to exceed 1.2 kg. The contents must be contained in product container described in 5(a)(3)(iii).

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

The total contents not to exceed 120 kg U, with the U-235 content not to exceed 1.2 kg. The contents must be contained in product container described in 5(a)(3)(ii).

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:	
For contents described in 5(b)(1)(i) and limited in 5(b)(2)(i):	1.8
For contents described in 5(b)(1)(ii) and limited in 5(b)(2)(ii):	0.6
For contents described in 5(b)(1)(iii) and 5(b)(1)(iv), and limited in 5(b)(2)(iii) and 5(b)(2)(iv):	0.4

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

   a. The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application.

   b. The packaging must meet the Acceptance Tests and Maintenance Program in Chapter 8 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: June 30, 2005.

REFERENCES

Siemens Power Corporation application dated January 26, 2000.

Supplements dated: January 31, June 6, and June 15, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: July 3, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9218	11	USA/9218/B(U)F-85	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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation application dated August 11, 1999, as supplemented.

c. DOCKET NUMBER 71-9218

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.: TRUPACT-II

(2) Description

A stainless steel and polyurethane foam insulated shipping container designed to provide double containment for shipment of contact-handled transuranic waste. The packaging consists of an unvented, 1/4-inch thick stainless steel inner containment vessel (ICV), positioned within an outer containment assembly (OCA) consisting of an unvented 1/4-inch thick stainless steel outer containment vessel (OCV), a 10-inch thick layer of polyurethane foam and a 1/4 to 3/8-inch thick outer stainless steel shell. The package is a right circular cylinder with outside dimensions of approximately 94 inches diameter and 122 inches height. The package weighs not more than 19,250 pounds when loaded with the maximum allowable contents of 7,265 pounds.

The OCA has a domed lid which is secured to the OCA body with a locking ring. The OCV containment seal is provided by a butyl rubber O-ring (bore seal). The OCV is equipped with a seal test port and a vent port.

The ICV is a right circular cylinder with domed ends. The outside dimensions of the ICV are approximately 73 inches diameter and 98 inches height. The ICV lid is secured to the ICV body with a locking ring. The ICV containment seal is provided by a butyl rubber O-ring (bore seal). The ICV is equipped with a seal test port and vent port. Aluminum spacers are placed in the top and bottom domed ends of the ICV during shipping. The cavity available for the contents is a cylinder of approximately 73 inches diameter and 75 inches height.

5.(a)(3) Drawings

The packaging is constructed in accordance with Packaging Technology Inc. Drawing No. 2077-500 SNP, Sheets 1 through 11, Rev. N. The contents are positioned within the packaging in accordance with Nuclear Packaging Inc. Drawing Nos. 2077-007 SNP, Rev. C, and 2077-008 SNP, Sheets 1 and 2, Rev. C. The pipe overpack is constructed and assembled in accordance with U.S. Department of Energy, Carlsbad Area Office, Drawing No. 163-001, Sheets 1 through 3, Rev. 1.

(b) Contents

(1) Type and form of material

Dewatered, solid or solidified transuranic and tritium-contaminated materials and wastes. Materials must be packaged in one of the following payload containers: a 55-gallon drum, standard waste box (SWB), pipe overpack, or ten-drum overpack (TDOP). The payload containers are described in Appendix 1.3.3 of the application, "Specifications for Authorized Payload Containers." Materials must be restricted to prohibit explosives, corrosives, nonradioactive pyrophorics and pressurized containers. Within a payload container, radioactive pyrophorics must not exceed 1 percent by weight, and free liquids must not exceed 1 percent by volume. Flammable organics are limited to 500 ppm in the headspace of any payload container.

(2) Maximum quantity of material per package

Contents not to exceed 7,265 pounds including shoring and secondary containers. The maximum gross weight for a payload container not to exceed the following:

(i) 1,000 pounds per 55-gallon drum,
(ii) 328 pounds per 6-inch pipe overpack,
(iii) 547 pounds per 12-inch pipe overpack,
(iv) 4,000 pounds per SWB, and
(v) 6,700 pounds per TDOP.

Maximum number of payload containers per package and authorized packaging configurations are as follows:

(i) 14 55-gallon drums,
(ii) 14 pipe overpacks,
(iii) 2 SWBs,
(iv) 2 SWBs, each SWB containing 1 bin,
(v) 2 SWBs, each SWB containing up to 4 55-gallon drums,
(vi) 1 TDOP
(vii) 1 TDOP, containing up to 10 55-gallon drums,
(viii) 1 TDOP, containing up to 6 85-gallon drums,
(ix) 1 TDOP, containing 1 SWB,
(x) 1 TDOP, containing 1 bin within an SWB, or
(xi) 1 TDOP, containing up to 4 55-gallon drums within an SWB.

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

Fissile material not to exceed the following:

Payload Container Type	Pu-239 Equivalent Per Payload Container	Pu-239 Equivalent Per Package
55-gallon drum	200 grams	325 grams
Pipe overpack	200 grams	2,800 grams
SWB	325 grams	325 grams
TDOP	325 grams	325 grams

Pu-239 equivalent must be determined in accordance with Appendix 1.3.7 of the application, Section 3.1, "Nuclear Criticality."

Maximum decay heat per package not to exceed 40 watts. Decay heat per payload container not to exceed the values given in Appendix 1.3.7 of the application, Table 5-6, "List of Approved Shipping Categories, Maximum Allowable Hydrogen Gas Generation Rates, and Maximum Allowable Wattages."

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.0

6. Physical form, chemical properties, chemical compatibility, configuration of waste containers and contents, isotopic inventory, fissile content, decay heat, weight and center of gravity, radiation dose rate must be determined and limited in accordance with Appendix 1.3.7 of the application, "TRUPACT-II Authorized Methods for Payload Control" (TRAMPAC).

7. Each payload container must be assigned to a shipping category in accordance with Appendix 1.3.7 of the application, Section 5.1, "Payload Shipping Category." Each payload container and payload assembly must not exceed the allowable wattage in accordance with Appendix 1.3.7 of the application, Section 5.2, "Decay Heat," or must be tested for gas generation in accordance with Appendix 1.3.7 of the application, Section 5.3, "Test Category Requirements."

8. Each payload container must be labeled to indicate its shipping category. Payload containers within a package shall be selected in accordance with Appendix 1.3.7 of the application, Section 6.0, "Payload Assembly Requirements."

9. Each payload container must be equipped with filtered vents meeting the minimum requirements of Appendix 1.3.5 of the application, "Specification for Filter Vents." Drums which were not equipped with filtered vents during storage must be aspirated in accordance with Appendix 1.3.7 of the application, Section 5.5, "Venting and Aspiration."

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

    (a) Each package must be prepared for shipment and operated in accordance with the procedures described in Chapter 7.0, "Operating Procedures," of the application, as supplemented.

    (b) Each package must be tested and maintained in accordance with the procedures described in Chapter 8.0, "Acceptance Tests and Maintenance Program," of the application, as supplemented.

    (c) Prior to each shipment, the lid and vent port seals on the inner and outer containment vessels must be leak tested in accordance with Appendix 7.4.2 of the application, "Assembly Verification Leak Test."

    (d) All free standing water must be removed from the inner containment vessel cavity and the outer containment vessel cavity before 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: June 30, 2004.

REFERENCES

Westinghouse Electric Corporation application dated August 11, 1999.

Supplements dated: July 23 and October 7, 1999.

"TRUPACT-II Content Codes (TRUCON)," DOE/WIPP 89-004, Rev. 12, dated July 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: December 28, 1999

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9221	3	USA/9221/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 and Transportation of Radioactive Material."

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

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

a. ISSUED TO *(Name and Address)*

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 dated November 2, 1995, as supplemented.

c. DOCKET NUMBER 71-9221

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.: NRBK-41

(2) Description

Top loading cylindrical lead shielded 304L stainless steel clad casks for the shipment of irradiated test specimens. The cask has an outside diameter of 27.16 inches and is 40 inches high. The outer shell is 1/2-inch thick stainless steel. The cask cavity is 5 inches in diameter by 16 inches deep and is provided with a bottom drain. The cavity shell is 1/4-inch thick stainless steel and is shielded by 10 inches of lead. The cask is closed by a lead-filled flanged plug fitted with an elastometer O-ring gasket and bolted closure. The cask has a seal-welded, 1/4-inch thick, stainless steel outer thermal shield which provides a 1/16-inch air gap between the outer surface of the cask outer shell and the inside surface of the thermal shield. A one-inch thick stainless steel plate is welded to the bottom of cask. A second one-inch thick stainless steel plate with a 1/8-inch deep, 25.5-inch diameter recess is welded to the first plate to provide a thermal shield for the bottom surface of the cask. The cask is bolted to a 48-inch square, all welded, "I" beam skid. Gross weight of the package is approximately 9,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Battelle Memorial Institute Drawing No. 41-0001, Sheet 1, Rev. D, and Sheet 2, Rev. E, and Westinghouse Electric Corporation Drawing No. 1755E01, Rev. D.

5. (b) Contents

(1) Type and form of material

Byproduct and special nuclear material in solid form, contained within either the MIN-41 or the HIP-41 product containers. The MIN-41 container is constructed in accordance with Westinghouse Electric Corporation, Drawing No. 2D77456 Rev. F. The HIP-41 product container is constructed in accordance with Westinghouse Electric Corporation Drawing No. 5D06622, Rev. B.

(2) Maximum quantity of material per package

The fissile contents of the package must 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 x grams U-235 + 1.4 x grams U-233 + 1.6 x grams plutonium. The maximum decay heat load per package must not exceed 240 Btu/hr.

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

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.0

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

(a) The package must be operated in accordance with the Operating Procedures in Section 7.0 of the application, as supplemented.

(b) The package must be maintained in accordance with the Maintenance Procedures in Section 8.2 of the application, as supplemented.

7. The NRBK-41 shipping container may be covered with a wrapping of polyvinyl chloride (PVC) during shipment provided the shipment is made in a closed vehicle. The applicable requirements of 10 CFR §71.87 must be satisfied prior to wrapping the shipping container.

8. Expiration date: September 30, 2001.

REFERENCES

Safety Analysis for Radioactive Material Shipping Cask No. NRBK-41 dated November 2, 1995.

Supplement: Naval Reactors letter #S96-11965 dated August 28, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William D. Travers, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 9/11/96

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9225	24	71-9225	USA/9225/B(U)F-85	1	OF	15

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

NAC International, Inc.
655 Engineering Drive
Suite 200
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Assurance Corporation application dated January 14, 2000, as supplemented.

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-LWT

(2) Description

The LWT is a steel-encased, lead-shielded shipping cask. The cask is designed to transport one PWR assembly, two BWR assemblies, up to 15 metallic fuel rods, up to 42 MTR fuel assemblies and plates, up to 25 individual PWR rods, up to 25 individual high burnup PWR or BWR rods, up to 140 TRIGA fuel elements, or up to 560 TRIGA fuel cluster rods. The overall dimensions of the package, with impact limiters, are 232 inches long by 65 inches in diameter. The cask body is approximately 200 inches in length and 44 inches in diameter. The cask cavity is 178 inches long and 13.4 inches in diameter. The volume of the cavity is approximately 14.5 cubic feet.

The cask body consists of a 0.75-inch-thick stainless steel inner shell, a 5.75-inch-thick lead gamma shield, a 1.2-inch-thick stainless steel outer shell, and a neutron shield tank. The inner and outer shells are welded to a 4-inch-thick stainless steel bottom end forging. The cask bottom consists of a 3-inch-thick, 20.75-inch-diameter lead disk enclosed by a 3.5-inch-thick stainless steel plate and bottom end forging. The cask lid is 11.3-inch-thick stainless steel stepped design, secured to a 14.25-inch-thick ring forging with twelve 1-inch diameter bolts. The cask seal is a metallic O-ring. A second teflon O-ring and a test port are provided to leak test the seal. Other penetrations in the cask cavity include the fill and drain ports, which are sealed with port covers and teflon O-rings.

The neutron shield tank consists of a 0.24-inch-thick stainless steel shell with 0.50-inch-thick end plates. The neutron shield region is 164-inches long and 5-inches thick. The neutron shield tank contains an ethylene glycol/water solution that is 1% boron by weight.

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

The cask is equipped with aluminum honeycomb impact limiters. The top impact limiter has an outside diameter of 65.25 inches and a maximum thickness of 27.8 inches. The bottom impact limiter has an outside diameter of 60.25 inches and maximum thickness of 28.3 inches. Both impact limiters extend 12 inches along the side of the cask body.

The maximum weight of the package is 52,000 pounds and the maximum weight of the contents and basket is 4,000 pounds.

(3) Drawings

(i) The packaging is constructed in accordance with the following Nuclear Assurance Corporation Drawings:

LWT 315-40-01, Rev. 4	Cask Assembly
LWT 315-40-02, Rev. 10	Body Assembly
LWT 315-40-03, Rev. 15 (Sheets 1-6)*	Transport Cask Body
LWT 315-40-04, Rev. 9	Cask Lid Assembly
LWT 315-40-05, Rev. 7	Upper Impact Limiter
LWT 315-40-06, Rev. 7	Lower Impact Limiter
LWT 315-40-08, Rev. 11 (Sheets 1-3)	Cask Parts Detail

* Packaging Unit Nos. 1, 2, 3, 4, and 5 are constructed in accordance with Drawing No. LWT 315-40-03, Rev. 6 (Sheets 1-6).

(ii) The fuel assembly baskets are constructed in accordance with the following Nuclear Assurance Corporation and NAC International Drawings:

LWT 315-40-09, Rev. 2	PWR Basket Spacer
LWT 315-40-10, Rev. 3	PWR Basket
LWT 315-40-11, Rev. 2	BWR Basket Assembly
LWT 315-40-12, Rev. 3	Metal Fuel Basket Assembly
LWT 315-40-045, Rev. 4	42 MTR Element Base Module
LWT 315-40-046, Rev. 4	42 MTR Element Intermediate Module
LWT 315-40-047, Rev. 4	42 MTR Element Top Module
LWT 315-40-048, Rev. 1	42 MTR Element Cask Assembly
LWT 315-40-049, Rev. 4	28 MTR Element Base Module
LWT 315-40-050, Rev. 4	28 MTR Element Intermediate Module
LWT 315-40-051, Rev. 4	28 MTR Element Top Module
LWT 315-40-052, Rev. 1	28 MTR Element Cask Assembly
LWT 315-40-070, Rev. 3	7 Cell Basket TRIGA Base Module
LWT 315-40-071, Rev. 3	7 Cell Basket TRIGA Intermediate Module
LWT 315-40-072, Rev. 3	7 Cell Basket TRIGA Top Module
LWT 315-40-079, Rev. 1	TRIGA Fuel Cask Assembly
LWT 315-40-080, Rev. 2	7 Cell Poison Basket TRIGA Base Module

5.(a)(3)(ii) Drawings (continued)

LWT 315-40-081, Rev. 2	7 Cell Poison Basket TRIGA Intermediate Module
LWT 315-40-082, Rev. 2	7 Cell Poison Basket TRIGA Top Module
LWT 315-40-083, Rev. 0	Spacer, LWT Cask Assembly TRIGA Fuel
LWT 315-40-084, Rev. 2	LWT Transport Cask Assy 140 TRIGA Elements
LWT 315-40-090, Rev. 2	35 MTR Element Base Module
LWT 315-40-091, Rev. 2	35 MTR Element Intermediate Module
LWT 315-40-092, Rev. 2	35 MTR Element Top Module
LWT 315-40-094, Rev. 2	35 MTR Element Cask Assembly
LWT 315-40-096, Rev. 2	Fuel Rod Insert, TRIGA Fuel
LWT 315-40-098, Rev. 1	Can Assembly, LWT Pin Shipment
LWT 315-40-099, Rev. 3	Can Weldment, PWR/BWR Transport Canister
LWT 315-40-100, Rev. 1	Lids, PWR/BWR Transport Canister
LWT 315-40-101, Rev. 0	4 x 4 Insert, PWR/BWR Transport Canister
LWT 315-40-102, Rev. [illegible]	5 x 5 Insert, PWR/BWR Transport Canister
LWT 315-40-103, Rev. 0	Pin Spacer, PWR Transport Canister
LWT 315-40-104, Rev. 0	LWT Cask Assembly, PWR Transport Canister
LWT 315-40-105, Rev. 3	PWR Insert, PWR/BWR Transport Canister
LWT 315-40-106, Rev. 1 sheets (1-3)	MTR Plate Canister, LWT Cask

5.(b) Contents

(1) Type and form of material

(i) Irradiated PWR fuel assemblies. The maximum fuel assembly weight is 1650 pounds, the maximum average burnup is 35,000 MWD/MTU, the minimum cool time is 2 years, and the maximum initial fuel pin pressure at 70°F is 565 psig. The fuel assemblies consist of uranium dioxide pellets within zircaloy cladding, with the specifications listed below, and with fuel rod pitch, rod diameter, clad thickness, and pellet diameter as described in Table 1.2-5, of the application, as supplemented.

Fuel Type	No. Fuel Rods	Max. Initial Uranium Enrichment (w/o U-235)	Max. Initial Uranium Mass (MTU)	Max. Active Fuel Length (in.)
B&W 15x15	208	3.5	0.4750	144.0
B&W 17x17	264	3.5	0.4658	143.0
CE 14x14	176	3.7	0.4037	137.0
CE 16x16	236	3.7	0.4417	150.0
WE 14x14 Std	179	3.7	0.4145	145.2
WE 14x14 OFA	179	3.7	0.3612	144.0
WE 15x15	204	3.5	0.4646	144.0
WE 17x17 Std	264	3.5	0.4671	144.0
WE 17x17 OFA	264	3.5	0.4282	144.0
Ex/ANF 14x14 WE	179	3.7	0.3741	144.0
Ex/ANF 14x14 CE	176	3.7	0.3814	134.0
Ex/ANF 15x15 WE	204	3.7	0.4410	144.0
Ex/ANF 17x17 WE	264	3.5	0.4123	144.0

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5.(b)(1) Type and form of material (continued)

(ii) Irradiated BWR fuel assemblies. The maximum fuel assembly weight is 750 pounds, the maximum average burnup is 30,000 MWD/MTU, the minimum cool time is 2 years, and the maximum initial fuel pin pressure at 70°F is 565 psig. The fuel assemblies consist of uranium dioxide pellets within zircaloy cladding, with the specifications listed below, and with fuel rod pitch, rod diameter, clad thickness, and pellet diameter as described in Table 1.2-6, of the application, as supplemented.

Fuel Type	No. Fuel Rods	No. Water Rods	Max. Initial Uranium Enrichment (w/o U-235)	Max. Initial Uranium Mass (MTU)	Max. Active Fuel Length (in.)
GE 7x7	49	0	4.0	0.1923	146
GE 8x8-1	63	1	4.0	0.1880	146
GE 8x8-2	62	2	4.0	0.1847	150 (1)
GE 8x8-4	60	4	4.0	0.1787	150 (1,2)
GE 9x9	74	2	4.0	0.1854	150 (1,3,4)
	79	2	4.0	0.1979	150 (1,4)
Ex/ANF 7x7	49	0	4.0	0.1960	144
Ex/ANF 8x8-1	63	1	4.0	0.1764	145.2
Ex/ANF 8x8-2	62	2	4.0	0.1793	150
Ex/ANF 9x9	79	2	4.0	0.1779	150
	74	2	4.0	0.1666	150 (3)

(1) Six-inch natural uranium blankets on top and bottom.
(2) One large water hole - 3.2 cm ID, 0.1 cm thickness.
(3) Two large water holes occupying seven fuel rod locations - 2.5 cm ID, 0.07 cm thickness.
(4) Shortened active fuel length in some rods.

(iii) Irradiated PWR rods, consisting of uranium dioxide pellets within zircaloy cladding. The maximum uranium enrichment is 5 weight percent U-235, the maximum active fuel length is 150 inches, and the maximum pellet diameter is 0.3765 inches. The maximum burnup is 60,000 MWD/MTU and the minimum cool time is 150 days. Up to two rods may have a maximum burnup of 65,000 MWD/MTU.

5.(b)(1) Type and form of material (continued)

(iv) Irradiated HEU MTR fuel assemblies positioned within the MTR fuel basket specified in 5.(a)(3)(ii). The fuel assemblies are composed of aluminum clad plates, with initial uranium enrichment of from 80 to 94.0 weight percent U-235, and meeting the following specifications:

	HEU MTR Assemblies	HEU MTR Assemblies	HEU MTR Assemblies
Maximum Number of Plates (including outer plates, which may or may not contain fuel)	23	19	10
Fuel Composition	U-Al, U_3O_8-Al, or U_3Si_2-Al		
Maximum Fuel Assembly Weight	13 lb (5.9 kg)		
Maximum Active Fuel Thickness	0.021 in (0.053 cm)	0.04 in (0.1016 cm)	0.069 in (0.175 cm)
Minimum Clad Thickness	0.0145 in (0.037 cm)	0.00945 in (0.024 cm)	0.015 in (0.038 cm)
Maximum Initial U-235 Mass per Assembly	355 grams (2)	262 grams	140 grams
Maximum Initial U-235 Mass per Fuel Plate	19.5 grams (2)	13.8 grams	14.0 grams
Maximum Burnup	554,700 MWD/MTU (1)		
Maximum Decay Heat per Fuel Assembly	120 watts (1)		
Maximum Decay Heat per Package	1.26 kilowatts		
Minimum Cool Time	90 days (1)		

(1) The minimum cool time shall be consistent with the decay heat limits in Item 5.(b)(2)(iv) and determined using the operating procedures in Section 7.1.5 and Figure 7.1-2 of the application, as supplemented. Maximum burnup for NISTR is 642,000 MWD/MTU, and the minimum cool time is 3.5 years for any fuel with a burnup exceeding 554,700 MWD/MTU.

(2) NISTR fuel is shipped as two fuel element segments per basket cell. The maximum initial U-235 mass for NISTR fuel may not exceed 181 grams per fuel element segment or 362 grams per basket cell. The maximum initial U-235 mass for NISTR fuel may not exceed 10.65 grams per fuel plate segment.

5.(b)(1) Type and form of material (continued)

(v) Irradiated LEU MTR fuel assemblies positioned within the MTR fuel basket specified in 5(a)(3)(ii). The fuel assemblies are composed of aluminum clad plates, with a maximum initial uranium enrichment of 20.0 weight percent U-235, and meeting the following specifications:

	LEU MTR Assemblies	LEU MTR Assemblies
Maximum Number of Plates (including outer plates, which may or may not contain fuel)	23	10
Fuel Composition	U-Al, U_3O_8-Al, or U_3Si_2-Al	
Maximum Fuel Assembly Weight	13 lb (5.9 kg)	
Maximum Active Fuel Thickness	0.033 in (0.084 cm)	0.069 in (0.175 cm)
Minimum Clad Thickness	0.013 in (0.033 cm)	0.015 in (0.038 cm)
Maximum Initial U-235 Mass per Assembly	340 grams	210 grams
Maximum Initial U-235 Mass per Fuel Plate	21.0 grams	21.0 grams
Maximum Burnup	90,490 MWD/MTU (50% U-235)	
Maximum Decay Heat per Fuel Assembly	24 watts	
Maximum Decay Heat per Package	1.0 kilowatt	
Minimum Cool Time	1 year	

(vi) Metallic fuel rods containing natural enrichment uranium pellets with aluminum cladding 0.080-inches thick. The fuel pellet diameter is 1.36 inches and the maximum fuel rod length is 120.5 inches. The maximum weight of uranium per rod is 54.5 kg with a maximum average burnup of 1,600 MWD/MTU and a minimum cooling time of one year.

5.(b)(1) Type and form of material (continued)

(vii) Irradiated TRIGA fuel elements with a 0.225" diameter zirconium rod in the center and meeting the following specifications:

	TRIGA HEU (Notes 1& 2)	TRIGA LEU (Notes 1& 2)	TRIGA LEU (Notes 1& 2)
Fuel Form	Clad U-ZrH rod	Clad U-ZrH rod	Clad U-ZrH rod
Maximum Element Weight, lbs	13.2	13.2	6.4
Maximum Element Length, in	45	45	28.4
Element Cladding	Stainless Steel	Stainless Steel	Aluminum
Clad Thickness, in	0.02	0.02	0.03
Active Fuel Length, in	15	15	14-15 (Note 4)
Element Diameter, in	1.478 max.	1.478 max.	1.47 max.
Fuel Diameter, in	1.435 max.	1.435 max.	1.41 max.
Maximum Initial U Content/Element, kilograms	0.196	0.845	0.205
Maximum Initial ^{235}U Mass, grams	137	169	41
Maximum Initial ^{235}U Enrichment, weight percent	70	20	20
Zirconium Mass, grams	2060	1886 - 2300	2300
Hydrogen to Zirconium Ratio, max.	1.6	1.7	1.0
Maximum Average Burnup, MWD/MTU	460,000 (80% ^{235}U)	151,100 (80% ^{235}U)	151,100 (80% ^{235}U)
Minimum Cooling Time	90 days (Note 3)	90 days (Note 3)	90 days (Note 3)

Notes:
1. Mixed TRIGA LEU and HEU contents authorized.
2. TRIGA Standard, instrumented and fuel follower control rod type elements authorized.
3. Maximum decay heat of any element is 7.5 watts.
4. Aluminum clad fuel with 14 inch active fuel is solid and has no central hole with a zirconium rod.

5.(b)(1) Type and form of material (continued)

(viii) Irradiated TRIGA fuel cluster rods with a maximum average burnup of 600,000 MWD/MTU (80% ^{235}U) and a minimum cooling time of 160 days meeting the following specifications prior to irradiation:

	TRIGA Fuel Cluster Rods
Fuel Form	Clad U-ZrH rod
Maximum Rod Weight, lbs	1.5
Maximum Rod Length, in	31
Rod Cladding	Incoloy 800
Minimum Clad Thickness, in	0.015
Maximum Active Fuel Length, in	22.5
Maximum Fuel Pellet Diameter, in	0.53
Maximum U Content/Rod, grams	48.6
Maximum ^{235}U Mass, grams	45.4
Maximum ^{235}U Enrichment, weight percent	93.3
Maximum Zirconium Mass, grams	421
Hydrogen to Zirconium Ratio, max.	1.6

(ix) Irradiated high burnup PWR rods, consisting of uranium dioxide pellets within zircaloy cladding. The maximum uranium enrichment is 5 weight percent U-235, the maximum active fuel length is 150 inches, and the maximum pellet diameter is 0.3765 inches. The maximum burnup is 80,000 MWD/MTU and the minimum cool time is 150 days.

(x) Irradiated high burnup BWR rods, consisting of uranium dioxide pellets within zircaloy cladding. The maximum uranium enrichment is 5 weight percent U-235, the maximum active fuel length is 150 inches, and the maximum pellet diameter is 0.490 inches. The maximum burnup is 80,000 MWD/MTU and the minimum cool time is between 150 - 270 days, as specified in the table below:

BWR Fuel Type Array Size	Burnup, b (GWD/MTU)	Minimum Cool Time (days)
7 x 7	$b \leq 60$ $60 < b \leq 70$ $70 < b \leq 80$	210 240 270
8 x 8[1]	$b \leq 80$	150

Note 1: Includes rods from all larger BWR assembly arrays (e.g., 9 x 9, 10 x 10)

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

Not to exceed 4,000 pounds, including contents and fuel assembly basket.

(i) For the contents described in Item 5.(b)(1)(i): one PWR assembly positioned within the PWR fuel assembly basket. Maximum decay heat not to exceed 2.5 kilowatts per PWR assembly.

(ii) For the contents described in Item 5.(b)(1)(ii): two BWR assemblies positioned with the BWR fuel assembly basket. Maximum decay heat not to exceed 1.1 kilowatts per BWR assembly.

(iii) For PWR rods as described in Item 5.(b)(1)(iii): up to 25 intact individual rods in a Type 304 stainless steel spacer canister with a wall thickness of at least 0.12 inches positioned within the PWR or BWR basket. Maximum decay heat not to exceed 1.41 kilowatts per package.

(iv) For MTR fuel assemblies as described in Items 5.(b)(1)(iv) and 5.(b)(1)(v):

Up to 42 fuel assemblies positioned within the MTR fuel assembly basket (7 fuel assemblies per basket module). For NISTR fuel the 42 fuel assemblies may be cut in half, producing 84 fuel-bearing sections. Each of the MTR basket cell openings may contain a loose plate canister. The contents of each loose plate canister are limited to the number of fuel plates, dimensions, and masses that are equivalent to an intact MTR fuel element, as specified in Items 5.(b)(1)(iv) and 5.(b)(1)(v).

(a) For HEU MTR fuel assemblies, the maximum decay heat not to exceed 1.26 kilowatts per package, with each MTR fuel assembly basket module not to exceed 210 watts. The center fuel assembly in any basket module is not to exceed 120 watts. The two exterior fuel assemblies vertically in-line with the center assembly for transport are not to exceed 70 watts. Fuel assemblies not to exceed 30 watts may be loaded in any basket position.

(b) For LEU MTR fuel assemblies, the maximum decay heat not to exceed 24 watts per fuel assembly.

(c) Mixed LEU and HEU MTR contents, with decay heat limits as specified above, are authorized.

(d) MTR fuel assemblies with corrosion and/or mechanically damaged cladding are authorized, provided the total surface area of through-clad corrosion and/or mechanical damage does not exceed 2,775 cm^2 per package.

(v) For the contents described in Item 5.(b)(1)(vi): up to 15 intact metallic fuel rods positioned within the appropriate basket. Maximum decay heat not to exceed 0.036 kilowatts per rod. Total weight of all rods not to exceed 1,805 pounds.

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

(vi) For failed metallic fuel rods of the type described in Item 5.(b)(1)(vi):

(a) Up to six canisters containing one defective metallic fuel rod per canister. The canisters are 2.75-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D2, Rev. 10, and are placed in a six-hole liner as shown on Nuclear Assurance Corporation Drawing No. 315-040-43, Rev. 1. The maximum decay heat load for a defective metallic fuel rod is limited to 5 watts; or

(b) Up to three canisters containing either up to three defective metallic fuel rods per canister or up to 10 failed fuel filters per canister. The canisters are 4.00-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D1, Rev. 10, and are placed in a three-hole basket as shown on Nuclear Assurance Corporation Drawing No. 315-40-12, Rev. 3. The weight of the filters is limited to 125 pounds per canister. For canisters containing fuel rods, the maximum decay heat load is 15 watts per canister; and for canisters containing filters, the maximum decay heat load is 5 watts per canister. The plutonium content of the filters shall not exceed 20 curies per package.

(vii) For TRIGA fuel elements as described in Item 5.(b)(1)(vii):

Maximum decay heat not to exceed 7.5 watts per TRIGA fuel element (or equivalent for failed fuel) and 1050 watts per package. TRIGA fuel elements must be positioned in either the non-poisoned TRIGA fuel basket or in the poisoned TRIGA fuel basket. Fuel may not be loaded in the center cell of the non-poisoned TRIGA fuel basket.

(a) Up to 120 fuel elements in the non-poisoned TRIGA fuel basket, and up to 140 fuel elements in the poisoned TRIGA fuel basket (4 fuel elements per basket cell).

(b) Up to 12 screened canisters in the non-poisoned TRIGA fuel basket, and up to 14 screened canisters in the poisoned TRIGA fuel basket. The screened canisters are in accordance with NAC International Drawing Nos. 315-40-074, Rev. 1, 315-40-075, Rev. 1, and 315-40-076, Rev. 1. Up to four intact TRIGA fuel elements per screened canister.

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

(c) Up to 12 sealed canisters in the non-poisoned TRIGA fuel basket, and up to 14 sealed canisters in the poisoned TRIGA fuel basket. The sealed canisters are in accordance with NAC International Drawing Nos. 315-40-086, Rev. 0, 315-40-087, Rev. 3, and 315-40-088, Rev. 2. Up to a maximum equivalent of two fuel elements in the form of intact fuel, failed fuel or fuel debris per sealed canister. If the total failed fuel plutonium content of a package is greater than 20 Ci, all failed fuel containing plutonium must be enclosed in a sealed canister which is then leak tested to 3.2×10^{-7} std cm^3/sec (He) prior to shipment.

(d) Mixed intact and failed fuel contents are authorized. Base and top fuel basket modules may contain intact fuel elements, screened canisters, or sealed canisters. Intermediate fuel basket modules may contain only intact TRIGA fuel elements.

(viii) For TRIGA fuel cluster rods as described in Item 5.(b)(1)(viii):

Maximum decay heat not to exceed 1.875 watts per TRIGA fuel cluster rod (or equivalent for failed fuel) and 1050 watts per package. TRIGA fuel cluster rods must be positioned in either the non-poisoned TRIGA fuel basket or in the poisoned TRIGA fuel basket. Fuel may not be loaded in the center cell of the non-poisoned TRIGA fuel basket.

(a) Up to 480 rods in the non-poisoned TRIGA fuel basket, and up to 560 rods in the poisoned TRIGA fuel basket. TRIGA fuel cluster rods must be positioned within the fuel rod inserts as shown on NAC International Drawing No. 315-40-096, Rev. 2.

(b) Up to 12 sealed canisters in the non-poisoned TRIGA fuel basket, and up to 14 sealed canisters in the poisoned TRIGA fuel basket. The sealed canisters are in accordance with NAC International Drawing Nos. 315-40-086, Rev. 0, 315-40-087, Rev. 3, and 315-40-088, Rev. 2. Up to a maximum equivalent of six TRIGA fuel cluster rods in the form of intact fuel, failed fuel or fuel debris per sealed canister. If the total failed fuel plutonium content of a package is greater than 20 Ci, all failed fuel containing plutonium must be enclosed in a sealed canister which is then leak tested to 3.2×10^{-7} std cm^3/sec (He) prior to shipment.

(c) Mixed intact and failed fuel contents are authorized. Base and top fuel basket modules may contain intact fuel rods or sealed canisters. Intermediate fuel basket modules may contain only intact fuel rods.

(ix) For high burnup PWR rods as described in Item 5.(b)(1)(ix): up to 25 intact individual rods in the appropriate insert, placed within a sealed or free-flow canister, and positioned within the standard PWR basket. Maximum decay heat not to exceed 2.3 kilowatts per package.

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

(x) For high burnup BWR rods as described in Item 5.(b)(1)(x): up to 25 intact individual rods in the appropriate insert, placed within a sealed or free-flow canister, and positioned within the standard PWR basket. Maximum decay heat not to exceed 2.1 kilowatts per package.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1) For TRIGA fuel elements, TRIGA fuel cluster rods, metallic fuel rods, MTR fuel assemblies, up to 25 PWR fuel rods, and up to 25 high burnup PWR or BWR rods: 0.0

(2) For PWR fuel assemblies: 100

(3) For BWR fuel assemblies: 5.0

6. Known or suspected failed fuel assemblies (rods) or elements, and fuel with cladding defects greater than pin holes and hairline cracks are not authorized, except as described in Items 5.(b)(2)(iv)(d), 5.(b)(2)(vi), 5.(b)(2)(vii)(c), and 5.(b)(2)(viii)(b).

7. The cask must be dry (no free water) when delivered to a carrier for transport.

8. Bolt torque: The cask lids bolts must be torqued to 260 ft-lbs. The bolts used to secure the vent and drain port covers must be torqued to 100 inch-lbs.

9. Prior to each shipment, the package must be leak tested to 1×10^{-3} std cm^3/sec, except that replaced seals must be leak tested to 5.5×10^{-7} std cm^3/sec (He). Prior to first use, after third use, and at least once within the 12-month period prior to each subsequent use, the package must be leak tested to 5.5×10^{-7} std cm^3/sec (He).

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

(a) The metallic O-ring seal must be replaced prior to each shipment; and

(b) Each package must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application, as supplemented; and

(c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application, as supplemented. If the cask is loaded under water or water is introduced into the cask cavity, the cask must be vacuum dried as described in Chapter 7 of the application. The cask cavity must be backfilled with 1.0 atm of helium when shipping PWR or BWR assemblies.

11. When shipping PWR, BWR, MTR assemblies, TRIGA fuel elements, TRIGA fuel cluster rods, individual PWR rods, or high burnup PWR or BWR rods, the neutron shield tank must be filled with a mixture of water and ethylene glycol which will not freeze or precipitate in a temperature range from -40 °F to 250 °F. The water and ethylene glycol mixture must contain at least 1% boron by weight.

12. A personnel barrier must be used when shipping PWR or BWR assemblies. Shipments of MTR fuel assemblies, TRIGA fuel elements, TRIGA fuel cluster rods, individual PWR rods, or high burnup PWR or BWR rods must use the ISO container or a personnel barrier.

13. Packages used to ship metallic fuel rods may be shipped in a closed shipping container provided that the closed container, the cask tie-down and support system and transport vehicle (trailer) meet the applicable requirements of the Department of Transportation. When the cask is shipped in a closed shipping container, the center of gravity of the combined cask, closed shipping container and trailer must not exceed 75 inches.

14. The one-time shipment of HEU MTR fuel from the MNR Reactor at McMaster University, located in Ontario, Canada, is authorized as follows:

Contents

Type and form of material

Irradiated HEU MTR fuel assemblies positioned within the MTR fuel basket specified in Condition 5.(a)(3)(ii). The fuel assemblies are composed of aluminum clad plates, with an initial uranium enrichment up to 94.0 weight percent U-235. The fuel assemblies are limited to either:

(a) a maximum of 10 plates (including outer plates which may or may not contain fuel) with a maximum initial U-235 mass per fuel plate of 19 grams, maximum initial U-235 mass per fuel assembly of 190 grams, and a minimum fuel plate thickness (fuel plus cladding) of 0.145 cm; or

b) a maximum of 18 plates including a maximum of 16 fuel plates and 2 outer plates (which do not contain fuel) with a maximum initial U-235 mass per fuel plate of 15 grams, maximum initial U-235 mass per fuel assembly of 240 grams, and a minimum fuel plate thickness (fuel plus cladding) of 0.119 cm; or

c) a control assembly consisting of 9 fuel plates and 2 aluminum inner guide plates (which do not contain fuel), with a maximum initial U-235 mass per fuel plate of 15 grams, maximum initial U-235 mass per fuel assembly of 135 grams, and a minimum fuel plate thickness (fuel plus cladding) of 0.119 cm.

The fuel assemblies shall also meet the following specifications for Thin-Plate Assemblies specified in Condition 5.(b)(1)(iv); Fuel Composition, Maximum Fuel Assembly Weight, Maximum Burnup, Maximum Decay Heat per Fuel Assembly, Maximum Decay Heat per Package, and Minimum Cool Time.

14. (continued)

Maximum quantity of material per package

The assemblies shall meet the requirements of Condition 5.(b)(2)(iv) of the Certificate of Compliance.

Transport Index for Criticality Control

Minimum transport index to be shown on the label for nuclear criticality control: 0.

The one-time shipment authorization of Condition 14 expires on October 31, 2000.

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: February 28, 2005.

REFERENCES

NAC International, Inc., application dated January 14, 2000.

Supplements dated: February 11 and 18; April 10 and 21; May 1, 22 and 26; June 5, 12 and 20; August 23 and 31; and October 6 and 16, 2000.

FOR THE U. S. NUCLEAR REGULATORY COMMISSION

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

Date: October 20, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9226	0	USA/9226/B(U)F-85	1	7

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

General Atomics
3550 General Atomics Court
San Diego, California 92121-1194

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Atomics application dated August 31, 1994, as supplemented

c. DOCKET NUMBER

71-9226

4. CONDITIONS

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

5. **5.a Packaging**

(1) Model No.: GA-4

(2) Description

The GA-4 Legal Weight Truck Spent Fuel Shipping Cask consists of the packaging (cask and impact limiters) and the radioactive contents. The packaging is designed to transport up to four intact pressurized-water reactor (PWR) irradiated spent fuel assemblies as authorized contents. The packaging includes the cask assembly and two impact limiters, each of which is attached to the cask with eight bolts. The overall dimensions of the packaging are approximately 90 inches in diameter and 234 inches long.

The containment system includes the cask body (cask body wall, flange, and bottom plate); cask closure; closure bolts; gas sample valve body; drain valve; and primary O-ring seals for the closure, gas sample valve, and drain valve.

Cask Assembly

The cask assembly includes the cask, the closure, and the closure bolts. Fuel spacers are also provided when shipping specified short fuel assemblies to limit the movement of the fuel. The cask is constructed of stainless steel, depleted uranium, and a hydrogenous neutron shield. The cask external dimensions are approximately 188 inches long and 40 inches in diameter. A fixed fuel support structure divides the cask cavity into four spent fuel compartments, each approximately 8.8 inches square and 167 inches long. The closure is recessed into the cask body and is attached to the cask flange with 12 1-inch diameter bolts. The closure is approximately 26 inches square, 11 inches thick, and weighs about 1510 lbs.

The cask has two ports allowing access to the cask cavity. The closure lid has an integral half-inch diameter port (hereafter referred to as the gas sample valve) for gas sampling, venting, pressurizing, vacuum drying, leakage testing, or inerting. A 1-inch diameter port in the bottom plate allows draining, leakage testing, or filling the cavity with water. A separate drain valve opens and closes the port. The primary seals for the gas sample valve and drain valve are recessed from the outside cask surface as protection from punctures. The gas sample valve and the drain valve also have covers to protect them during transport.

Cask
The cask includes the containment (flange, cask body, bottom plate and drain valve seals); the cavity liner and fuel support structure; the impact limiter support structure; the trunnions and redundant lift sockets; the depleted uranium gamma shield; and the neutron shield and its outer shell. The cask body is square, with rounded corners and a transition to a round outer shell for the neutron shield. The cask has approximately a 1.5 inch thick stainless steel body wall, 2.6 inch thick depleted uranium shield (reduced at the corners), and 0.4 inch thick stainless steel fuel cavity liner.

The cruciform fuel support structure consists of stainless steel panels with boron-carbide (B_4C) pellets for criticality control. A continuous series of holes in each panel, at right angles with the fuel support structure axis, provides cavities for the B_4C pellets. The fuel support structure is welded to the cavity liner and is approximately 18 inches square by 166 inches long and weighs about 750 lbs.

The flange connects the cask body wall and fuel cavity liner at the top of the cask, and the bottom plate connects them at the bottom. The gamma shield is made up of five rings, which are assembled with zero axial tolerance clearance within the depleted uranium cavity, to minimize gaps. The impact limiter support structure is a slightly tapered 0.4 inch thick shell on each end of the cask. The shell mates with the impact limiter's cavity and is connected to the cask body by 36 ribs.

The neutron shield is located between the cask body and the outer shell. The neutron shield design maintains continuous shielding immediately adjacent to the cask body under normal conditions of transport. The details of the design are proprietary. The design, in conjunction with the operating procedures, ensures the availability of the neutron shield to perform its function under normal conditions of transport.

Two lifting and tie-down trunnions are located about 34 inches from the top of the cask body, and another pair is located about the same distance from the bottom. The trunnion outside diameter is 10 inches, increasing to 11.5 inches at the cask interface. Two redundant lift sockets are located about 26 inches from the top of the cask body and are flush with the outer skin.

Materials
All major cask components are stainless steel, except the neutron shield, the depleted uranium gamma shield, and the B_4C pellets contained in the fuel support structure. All O-ring seals are fabricated of ethylene propylene.

Impact Limiters
The impact limiters are fabricated of aluminum honeycomb, completely enclosed by an all-welded austenitic stainless steel skin. Each of the two identical impact limiters is attached to the cask with eight bolts. Each impact limiter weighs approximately 2,000 lbs.

(3) Drawings
The package shall be constructed and assembled in accordance with the following GA Drawing Number:

Drawing No. 031348,
sheets 1 through 19, Revision D
GA-4 Spent Fuel Shipping Cask Packaging Assembly

5.b Contents of Packaging

(1) Type and Form of Material:

(a) Intact fuel assemblies. Fuel with known or suspected cladding defects greater than hairline cracks or pinhole leaks is not authorized for shipment.

(b) The fuel authorized for shipment in the GA-4 package is irradiated 14x14 and 15x15 PWR fuel assemblies with uranium oxide fuel pellets. Before irradiation, the maximum enrichment of any assembly to be transported is 3.15 percent by weight of uranium-235 (^{235}U). The total initial uranium content is not to exceed 407 Kg per assembly for 14x14 arrays and 469 Kg per assembly for 15x15 arrays.

(c) Fuel assemblies are authorized to be transported with or without control rods or other non-fuel assembly hardware (NFAH). Spacers shall be used for the specific fuel types, as shown on sheet 17 of the Drawings.

(d) The maximum burnup for each fuel assembly is 35,000 MWd/MTU with a minimum cooling time of 10 years and a minimum enrichment of 3.0 percent by weight of ^{235}U or 45,000 MWd/MTU with a minimum cooling time of 15 years (no minimum enrichment).

(e) The maximum assembly decay heat of an individual assembly is 0.617 kW. The maximum total allowable cask heat load is 2.468 kW (including control components and other NFAH when present).

(f) The PWR fuel assembly types authorized for transport are listed in Table 1. All parameters are design nominal values.

(2) Maximum Quantity of Material per Package

(a) For material described in 5.b(1): four (4) PWR fuel assemblies.

(b) For material described in 5.b(1): the maximum assembly weight (including control components or other NFAH when present) is 1,662 lbs. The maximum weight of the cask contents (including control components or other NFAH when present) is 6,648 lbs., and the maximum gross weight of the package is 55,000 lbs.

Table 1 - PWR Fuel Assembly Characteristics

Fuel Type Mfr.-Array (Versions)	Design Initial U (kg/assy.)	No. of Fuel Rods	Fuel Rod Pitch (in.)	Pellet Diameter (in.)	Zr Clad Thickness (in.)	Active Fuel Length (in.)
W-15x15 (Std/ZC)	469	204	0.563	0.3659	0.0242	144
W-15x15 (OFA)	463	204	0.563	0.3659	0.0242	144
BW-15x15 (Mk.B,BZ,BGD)	464	208	0.568	0.3686	0.0265	142
Exx/A-15x15 (WE)	432	204	0.563	0.3565	0.030	144
CE-15x15 (Palisades)	413	204	0.550	0.358	0.026	144
CE-14x14 (Ft.Calhoun)	376	176	0.580	0.3765	0.028	128
W-14x14 (Model C)	397	176	0.580	0.3805	0.026	137
CE-14x14 (Std/Gen.)	386	176	0.580	0.3765	0.028	137
Exx/A-14x14 (CE)	381	176	0.580	0.370	0.031	137
W-14x14 (OFA)	358	179	0.556	0.3444	0.0243	144
W-14x14 (Std/ZCA,/ZCB)	407	179	0.556	0.3674	0.0225	145.5
Exx/A-14x14 (WE)	379	179	0.556	0.3505	0.030	142

5.c Transport Index for Criticality Control

Minimum transport index to be shown on the label for nuclear criticality control: 100

6. Fuel assemblies with missing fuel pins shall not be shipped unless dummy fuel pins that displace an equal amount of water have been installed in the fuel assembly.

7. For operating controls and procedures, in addition to the requirements of Subpart G of 10 CFR Part 71:

a. Each package shall be both prepared for shipment and operated in accordance with detailed written operating procedures. Procedures for both preparation and operation shall be developed using the specifications contained within the application. At a minimum, those procedures shall require the following provisions:

(1) Identification of the fuel to be loaded and independent verification that the fuel meets the specifications of Condition 5.b of the CoC.

(2) That before shipment the licensee shall:
(a) Perform a measured radiation survey to assure compliance with 49 CFR 173.441 and 10 CFR 71.47 and assure that the neutron and gamma measurement instruments are calibrated for the energy spectrums being emitted from the package.
(b) Verify that measured dose rates meet the following correlation to demonstrate compliance with the design bases calculated hypothetical accident dose rates:
3.4 x (peak neutron dose rate at any point on cask surface at its midlength) +
1.0 x (gamma dose rate at that location) $\leq$ 1000 mR/hr.
(c) Verify that the surface removable contamination levels meet the requirements of 49 CFR 173.443 and 10 CFR 71.87.
(d) Inspect all containment seals and closure sealing surfaces for damage. Leak test all containment seals with a gas pressure rise test after final closure of the package. The leak test shall have a test sensitivity of at least 1×10^{-3} standard cubic centimeters per second of air (std-cm^3/sec) and there shall be no detectable pressure rise. A higher sensitivity acceptance and maintenance test may be required as discussed in Condition 7.b(5), below.

(3) Before leak testing, the following closure bolt and valve torque specifications:
(a) The cask lid bolts shall be torqued to 235 ± 15 ft-lbs.
(b) The gas sample valve and drain valve shall be torqued to 20 ± 2 ft-lbs.

(4) During wet loading operations and prior to leak testing, the removal of water and residual moisture from the containment vessel in accordance with the following specifications:
(a) Cask evacuation to a pressure of 0.2 psia (10 mm Hg) or less for a minimum of 1 hour.
(b) Verifying that the cask pressure rise is less than 0.1 psi in 10 minutes.

(5) Before shipment, independent verification of the material condition of the neutron shield as described in SAR Section 7.1.1.4 or 7.1.2.4.

b. All fabrication acceptance tests and maintenance shall be performed in accordance with detailed written procedures. Procedures for fabrication, acceptance testing, and maintenance shall be developed using the specifications contained within the application and shall include the following provisions:

(1) All containment boundary welds, except the final fabrication weld joint connecting the cask body wall to the bottom plate, shall be radiographed and liquid-penetrant examined in accordance with ASME Code Section III, Division 1, Subsection NB. Examination of the final fabrication weld joint connecting the cask body wall to the bottom plate may be ultrasonic and progressive liquid penetrant examined in lieu of radiographic and liquid penetrant examination.

(2) The upper lifting trunnions and redundant lifting sockets shall be load tested, in the cask axial direction, to 300 percent of their maximum working load (79,500 lbs. minimum) per trunnion and per lifting socket, in accordance with the requirements of ANSI N14.6. The upper and lower lifting trunnions shall be load tested, in the cask transverse direction, to 150 percent of their maximum working load (20,625 lbs. minimum) per trunnion, in accordance with the requirements of ANSI N14.6.

(3) The cask containment boundary shall be pressure tested to 150% of the design pressure per 10 CFR 71.85(b). The minimum test pressure shall be 120 psig.

(4) All containment seals shall be replaced within the 12-month period prior to each shipment.

(5) A fabrication leakage test shall be performed on all containment components including the O-ring seals prior to first use. Additionally, all containment seals shall be leak tested after the third use of each package and within the 12-month period prior to each shipment. Any replaced or repaired containment system component shall be leak tested. The leakage tests shall verify that the containment boundary leakage rate does not exceed the design leakage rate of 1×10^{-7} std-cm^3/sec. The leak tests shall have a test sensitivity of at least 5×10^{-8} std-cm^3/sec.

(6) The depleted uranium shield shall be gamma scanned with 100 percent inspection coverage during fabrication to ensure that there are no shielding discontinuities. The neutron shield supplier shall certify that the shield material meets the minimum specified requirements (proprietary) used in the applicant's shielding analysis.

(7) Qualification and verification tests to demonstrate the crush strength of each aluminum honeycomb type and lot to be utilized in the impact limiters shall be performed.

(8) The boron carbide pellets, fuel support structure and fuel cavity dimensions, and ^{235}U content in the depleted uranium shall be fabricated and verified to be within the specifications of Table 2 to ensure criticality safety.

Table 2

Specified Parameter	Minimum	Maximum
B_4C boron enrichment	96 wt% ^{10}B	N/A
Diameter of each B_4C pellet	0.426 in	0.430 in
Height of each B_4C pellet stack	7.986 in	8.046 in
Mass of ^{10}B in each B_4C pellet stack	31.5 g	N/A
Mass of each B_4C pellet stack	43.0 g	45.0 g
Diameter of each fuel support structure hole	0.432 in	0.44 in
Fuel support structure nominal hole pitch	N/A	0.55 in
Fuel support structure hole depth minus B_4C pellet-stack height (at room temperature)	0.009 in	0.129 in
Thickness of each fuel support structure panel	0.600 in	0.620 in
Fuel cavity width	N/A	9.135 in
^{235}U content in depleted uranium shielding material	N/A	0.2 wt%

8. **This package is approved for exclusive-use transport by rail, truck or marine.**

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, 2003.**

REFERENCES

General Atomics Safety Analysis Report for the GA-4 Legal Weight Truck Spent Fuel Shipping Cask, Revision G (Proprietary) and Revision H (Non-Proprietary), transmitted by letter dated August 5, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

William F. Kane, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: October 27, 1998