NUREG-0383
Volume 2
Revision 18

Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

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1. The NRC Public Document Room, 2120 L Street, NW., Lower Level, Washington, DC 20555-0001
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The following documents in the NUREG series are available for purchase from the Government Printing Office: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, international agreement reports, grantee reports, and NRC booklets and brochures. Also available are regulatory guides, NRC regulations in the *Code of Federal Regulations*, and *Nuclear Regulatory Commission Issuances*.

Documents available from the National Technical Information Service include NUREG-series reports and technical reports prepared by other Federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal articles, and transactions. *Federal Register* notices, Federal and State legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Office of Administration, Distribution and Mail Services Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, Two White Flint North, 11545 Rockville Pike, Rockville, MD 20852-2738, for use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018-3308.

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Volume 2
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Certificates of Compliance

Manuscript Completed: October 1995
Date Published: October 1995

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 packagings which have been approved by the U.S. Nuclear Regulatory Commission. To assist in identifying packaging, an index by Model Number and corresponding Certificate of Compliance Number is included at the front of Volumes 1 and 2. An alphabetical listing by user name is included in the back of Volume 3 for approved QA programs. The reports include a listing of all users of each package design and approved QA programs prior to the publication date of the directory.

Comments which would make future revisions of this directory more useful are invited and should be directed to the Spent Fuel Project Office, U.S. Nuclear Regulatory Commission.

U.S. NUCLEAR REGULATORY COMMISSION
INDEX OF CERTIFICATES BY MODEL NUMBER
10/01/1995

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5984	5984	684AE	9028
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NRC FORM 618
(9-83)
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	5	USA/0361/B(U)F	1	4

PREAMBLE

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

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, 1998.

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

Date: SEP 27 1993

NRC FORM 618
(5-85)
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
4888	10	USA/4888/B( )	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*)

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

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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: December 31, 1996.

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.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 16 1993

NRC FORM 618
(5-85)
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
4909	13	USA/4909/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)*

General Electric Company
P.O. Box 780
Wilmington, NC 28401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Electric Company application dated January 26, 1994.

c. DOCKET NUMBER 71-4909

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: GE-21PF-1

(2) Description

Overpack for 30-inch diameter enriched uranium hexafluoride (UF_6) cylinders. The overpack is a right circular cylinder constructed of two stainless steel shells. The annular volume between the shells is filled with wood blocks and fire-resistant phenolic foam approximately 6 inches thick. The foam is in accordance with USAEC Specification 56-S-3, Rev. 1, and Supplement K/TL-729. 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 fourteen, 3/4-inch bolt/nut/washer assemblies. The overpack is approximately 43-5/8 inches OD by 95-1/2 inches long. Maximum gross weight of the package is 8,600 pounds.

(3) Drawings

The packaging is constructed in accordance with General Electric Company Drawing No. 769E237 - Sheet Nos. 1 and 2, Rev. 4. In addition, the length of the 8" x 2.5" tie-down support channel may be from 43 to 55 inches long and vent holes in the exterior shell may be sealed with plastic plugs.

(b) Contents

(1) Type and form of material

Uranium hexafluoride enriched in the U-235 isotope.

(2) Maximum quantity of material per package

(i) Model No. 30A cylinder: 4,950 pounds UF_6 enriched to not more than 5 w/o in the U-235 isotope.

(ii) Model No. 30B cylinder: 5,280 pounds UF_6 enriched to not more than 5 w/o in the U-235 isotope.

(c) Fissile Class

Minimum transport index 5.0

6. 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 Sections 7.2 and 8.2 of the application.

(c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.1 of the application.

(d) The loaded cylinder must be shipped without a valve protector. The valve protector must be replaced in accordance with normal handling practice when the cylinder is removed from the overpack.

(e) Prior to each shipment, the stainless steel components of the packaging must be visually inspected. Packaging in which stainless steel components show pitting, corrosion, cracking, or pinholes are not authorized for transport.

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

(b) All body seams and joints for the inner and outer shells (ends) and the side (end) panel moldings must be continuous welds. Welding must be by a fusion process in accordance with the American Welding Society Code or American Society of Mechanical Engineers' Code.

8. The 30-inch diameter UF_6 cylinders must be fabricated, inspected, tested and maintained in accordance with American National Standard N14.1 (1990 version). 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.

9. At least once every five years, each packaging must be inspected to verify the presence and condition of the insulation. The inspection shall consist of inserting a probe through each vent hole in both the lid and base to confirm the presence and rigidity of the insulation. For packagings which require drying, the inspection must be performed after drying.

10. Shackles are for lifting only. Shackles must not be used for tying down the package during transport.

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: November 30, 1999.

REFERENCES

General Electric Company application dated January 28, 1994.

Supplement dated October 28, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: NOV 30 1994

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
4986	31	USA/4986/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*)

General Electric Company
P.O. Box 780
Wilmington, NC 28402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated March 17, 1992, 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 Nos.: RA-2 and RA-3

(2) Description

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

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

(3) Drawings

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

769E229, Revision 5, Model RA-3 Outer Container
769E229, Revision 6, Model RA-3 Outer Container
(for contents described in 5(b)(1)(vii) and 5(b)(1)(viii) only)
769E231, Revision 4, Model RA-3 Inner Container
769E232, Revision 4, Model RA-2 Inner Container

(4) Product Container

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

5. (b) Contents

(1) Type and form of material

(i) Unirradiated UO_2 fuel assemblies with a maximum average U-235 enrichment of 3.2% by weight. Assembly rods are clad with a nominal 0.032-inch thickness of Zircaloy and have a nominal fuel pellet outside diameter of 0.410 inch. Each assembly, made up of a maximum 8 x 8 square array of fuel rods, must have a maximum fuel length of 174 inches with a maximum fuel cross-sectional area of 25 square inches.

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

(iii) Unirradiated UO_2 fuel rods with a maximum U-235 enrichment of 6.5% by weight. Rods are clad with Zircaloy, Incaloy, Inconel or stainless steel such that the ratio of clad to fuel cross-sectional area be at least 0.26, and have a maximum fuel pellet outside diameter of 0.508 inch. Each rod must have a maximum length of 174 inches. The clad rods must be bundled (contained) in the product container described in 5(a)(4).

(iv) Unirradiated UO_2 fuel assemblies in an 8 x 8 square array with a maximum fuel cross-sectional area of 25 square inches, maximum fuel length of 174 inches, and a maximum enrichment of 5% U-235. Pellet and cladding dimensions and nuclear poison specifications are to be in accordance with the limits established in Section 8.0, Appendix A, Section 1.0 of General Electric application dated March 17, 1992.

(v) Unirradiated UO_2 fuel assemblies in a 9 x 9 square array with a maximum nominal U-235 enrichment of 4.0% by weight and a maximum fuel length of 174 inches. Each fuel assembly may contain up to 74 fuel rods with a nominal pellet diameter of 0.376 inches as described in Section 7.0, Appendix C of General Electric application dated March 17, 1992.

(vi) Unirradiated UO_2 fuel assemblies in an 8 x 8 square array with a maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 174 inches. The maximum U-235 enrichment in the assembly does not exceed 4.025% by weight. Nuclear poison specifications are to be in accordance with the requirements in Section 8.0, Appendix D, of General Electric Company application dated March 17, 1992. Pellet and cladding dimensions are in accordance with the limits established in Section 8.0, Appendix A of General Electric application dated March 17, 1992.

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

(vii) Unirradiated UO_2 fuel assemblies with a maximum U-235 enrichment of 5.0% by weight, and a maximum average U-235 enrichment within any axial zone of the assembly of 4.6% by weight. Each assembly is made up of 74 full and partial length fuel rods in a 9 x 9 square array, and has a maximum fuel length of 150 inches and a maximum fuel cross-sectional area of 25 square inches. Maximum pellet diameter, minimum clad thickness, poison rod specifications, and partial length rod specifications are in accordance with General Electric supplement dated April 16, 1992.

(viii) Unirradiated UO_2 fuel assemblies with a maximum U-235 enrichment of 4.94% by weight. Each assembly is made up of 92 full and partial length fuel rods in a 10 x 10 square array with a maximum fuel length of 174 inches and a maximum fuel cross-sectional area of 25 square inches. Fuel pellet diameter, minimum clad thickness, and partial length rod specifications are in accordance with General Electric supplements dated October 5 and November 18, 1992.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iv), 5(b)(1)(vi), 5(b)(1)(vii):

Two (2) fuel assemblies.

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

Two (2) fuel bundles.

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

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

One (1) fuel assembly.

(c) Fissile Class I

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. Except for the contents described in 5(b)(1)(vii), polyethylene shipping shims may be inserted between rods within the fuel assemblies up to a maximum of 0.20 grams H_2O hydrogen equivalent per cubic centimeter averaged over the assembly. For contents described in 5(b)(1)(vii), polyethylene shims may be inserted between rods within the fuel assembly up to a maximum of 0.10 grams H_2O hydrogen equivalent per cubic centimeter averaged over the assembly, and polyethylene holders with a maximum average thickness of 0.338 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.

8. In lieu of the product container specified in 5(a)(4), except for UO_2 fuel rods with U-235 enrichment greater than 3.2%, clad rods must be bundled (bound with steel strappings at two or more locations) with a maximum cross sectional area of 20.0 square inches. The total breaking strength of the strapping must be 30 times the weight of the bound rods.

9. The maximum spacing between adjacent rods within the bundle must be 0.012 inch. The spacing must be maintained by the product container wall, metal strappings or peripheral metallic dunnage with a melting point greater than 1475°F within the bundle.

10. The contents described in 5(b)(1)(vii) and 5(b)(1)(viii) may be shipped in a Model RA-3 outer container fabricated in accordance with GE Drawing No. 769E229, Revision 6.

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

12. 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.

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

14. Expiration date: October 31, 1997.

REFERENCES

General Electric Company application dated March 17, 1992.

General Electric Company supplements dated: April 15, October 5, and November 18, 1992; and March 18, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Nancy L Osgood

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

Date: AUG 09 1993

NRC FORM 618
(9-89)
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	11	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 20% 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.

CONDITIONS *(continued)*

5. (b) Contents (continued)

(2) Maximum quantity of material per package

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

(c) Fissile Class III

Maximum number of packages per shipment One

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

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: SEP 3 1991

NRC FORM 618
(9-88)
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
5086	9	USA/5086/B(U)F	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*)

Babcock and Wilcox
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) Fissile Class II

Minimum Transport Index 1.4

6. Use of packaging constructed in accordance with United Nuclear Corporation Drawing No. D-20354-6, Sheet 7, Revision No. 4, and constructed before August 31, 1986, is authorized until January 31, 1995.

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 Chapter 7 of the application.

   (b) The package must be acceptance tested and maintained in accordance with 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, 1999.

REFERENCES

Babcock and Wilcox application dated November 29, 1993.

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: JAN 26 1995

NRC FORM 618
(9-83)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5149	8	USA/5149/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)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock & Wilcox Company application dated September 20, 1979, 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) Fissile Class — III

Maximum number of packages per shipment or per railroad car — Five (5)

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

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

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, 2000.

REFERENCE

Babcock & Wilcox application dated September 20, 1979, and supplement dated May 18, 1990, and April 27, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: June 23, 1995

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
5362	4	USA/5362/B( )	1	2

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 Agriculture
Agricultural Research Service
Radiological Safety Staff
6303 Ivy Lane
Greenbelt, MD 20770

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Department of Agriculture application October 17, 1980, as supplemented.

c. DOCKET NUMBER

71-5362

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: Natick Irradiator

(2) Description

The package is a cylindrical, steel-encased, lead-filled weldment 29-3/4" OD by 58" high, enclosed in a double-walled impact and fire shield (overpack) 57" by 45" by 90" high mounted on a pallet 57" by 45". The stepped cavity is 9.56" ID by 8-1/4", 12" ID by 27-1/2" and 20" ID by 1[illegible]-5/8". The source holder (drawer assembly) is 9.48" OD by 46.625" with 9-1/2" shielding on bottom and 12-1/8" on top. A lead shielded cask insert assembly 20" OD by 9.52" ID by 12.12" is installed at the top of the cask and the entire assembly is held in place with a 1" thick steel lid secured with twelve, 1" bolts. A cask drain line is sealed with a pipe plug. A 39" OD laminated plywood plug fills the space between the top of the cask and the overpack. Plywood will be positioned around the circumference of the irradiator for support. The cask weighs 16,000 lbs.

(3) Drawings

The packaging is constructed in accordance with Lockheed Nuclear Products Drawing Nos. 442-2093, Rev. 0, 442-2094, Rev. 0, 442-2096, Rev. 0; 442-2098, Rev. 0; 442-3002, Rev. 0; and U.S. Army Natick Research and Development Laboratories Drawing No. FE-81-16, Rev. 0.

5. (b) Contents

(1) Type and form of material

Cesium-137 sources meeting requirements for special form radioactive material.

(2) Maximum quantity of material per package

250,000 Ci.

6. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be maintained, operated and prepared for shipment in accordance with the operating procedures and maintenance program in supplement dated May 21, 1992.

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, 2000.

REFERENCES

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

Supplements dated: October 28, 1991, and May 21, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

FEB 14 1995

Date _____

NRC FORM 618
(9-83)
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
5450	32	USA/5450/AF	1	7

PREAMBLE

a. This certificate is issued to certify that the packaging 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 Corporation
P.O. Box 355
Pittsburgh, PA 15230

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation
application dated December 20, 1985,
as supplemented.

c. DOCKET NUMBER 71-5450

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: RCC, RCC-1, RCC-3, and RCC-4

(2) Description

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

(3) Drawings

The packagings are constructed in accordance with the following Westinghouse Electric Corporation Drawing Nos.:

For the RCC packaging:	RCCL002, Sheets 1 through 3, Rev. 2.
For the RCC-1 packaging:	RCCL102, Sheets 1 through 3, Rev. 2.
For the RCC-3 packaging:	RCCL302, Sheets 1 through 3, Rev. 2.
For the RCC-4 packaging:	RCCL402, Sheet 1, Rev. 3; Sheets 2 through 3, Rev. 2.

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

(5) Dimensions and placement of neutron absorber plates in accordance with unnumbered drawing attached to Westinghouse Letter # LA 89-19 dated 2/14/89.

(b) Contents

(1) Type and form of material

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

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

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

Type	17x17 Zr Clad
Pellet diameter, in	0.308 - 0.322
Rod diameter, in	0.360 - 0.374
Maximum fuel length, in	168
Maximum rods/element	264
Maximum cross section (nom) in sq	8.4
Maximum U-235/element, kg	19.3
Maximum U-235 enrichment, w/o	3.55

.(b) (1) Type and form of material (continued)

(iii) Uranium dioxide as Zircaloy clad unirradiated fuel elements. Two neutron absorber plates consisting of carbon steel, 0.035 inches in thickness, with a cermet Gd_2O_3 coating affixed to each side providing a total of 0.054 g-Gd_2O_3/cm^2 for both sides of the plate, are required between fuel elements of the following specifications:

Type	14x14 Zr Clad	15x15 Zr Clad	14x14 SST Clad	15x15 SST Clad	17x17 Zr Clad	17x17 Zr Clad	16x16 Zr Clad	16x16 Zr Clad
Pellet diameter (nom), in	0.344-0.367	0.367	0.384	0.384	0.322	0.308	0.322	0.325
Rod diameter (nom), in	0.400-0.422	0.422	0.422	0.422	0.374	0.360	0.374	0.382
Maximum fuel length, in	144	144	120	120	168	168	144	150
Maximum rods/element	180	204	180	204	264	264	235	236
Maximum cross section, (nom), in sq	7.8	8.4	7.8	8.4	8.4	8.4	7.8	7.98
Maximum U-235/element, kg	22.1	21.5	23.1	22.0	21.75 (144"L) 25.5 (168"L)	19.9 (144"L) 23.3 (168"L)	20.7	21.1
Maximum U-235 enrichment, w/o	5.0	4.3	5.0	4.3	4.7	4.3	5.0	5.0

Type	15x15 Zr Clad (B&W Type)
Pellet diameter (nom), in	0.367
Rod diameter (nom), in	0.422
Maximum fuel length, in	141.8
Rods/element	208
Maximum cross section, (nom), in sq	8.5
Maximum U-235/element, kg	17.8
Maximum U-235 enrichment, w/o	3.95

(b) (1) Continued

(iv) Uranium dioxide as Zircaloy clad unirradiated fuel elements containing a minimum of 48 IFBA rods and 25 Instrument/Guide tubes per specification and loading pattern described in Westinghouse drawing SKA-89044, Sheet 1, Rev. 2. Two neutron absorber plates consisting of carbon steel, 0.035 inches in thickness, with 4 mils of Gd_2O_3 (0.02 gm-Gd_2O_3/cm^2) affixed to each side of the plate are required between fuel elements of the following specifications:

Type	17 x 17 Zr Clad
Pellet diameter (nom), in	0.308
Rod diameter (nom), in	0.360
Maximum fuel length, in	168
Maximum rods/element	264
Maximum cross section (nom), in sq	8.4
Maximum U-235/element, kg	22.5 (144"L)
Minimum ZrB_2 rods/assembly	48
Minimum ZrB_2 IFBA length, in	108
Maximum U-235 enrichment, w/o	4.85

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

Type	17 x 17 Zr Clad
Pellet diameter (nom), in	0.308
Rod diameter (nom), in	0.360
Maximum fuel length, in	168
Maximum rods/element	264
Maximum cross section (nom), in sq	8.4
Maximum U-235/element, kg	22.5 (144"L)
Maximum U-235 enrichment, w/o	4.85

(b) (1) Continued

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

Type	SST Clad	Zr Clad	Zr Clad	Zr Clad	Zr Clad	Zr clad
Pellet diameter (nom), in	0.384	0.344-0.367	0.308-0.322	0.322	0.3805	0.325
Rod diameter, in	0.422	0.400-0.422	0.360-0.374	0.374	0.44	0.382
Fuel length (max), in	120	144	168	144	144	150
U-235 enrichment (max), w/o						
Note (1)	4.0	4.0	3.65	4.0	3.85	---
Note (2)	4.2	4.2	4.3	4.3	---	4.2
Note (3)	---	---	3.55	---	---	---

Notes:

(1) Two neutron absorber plates consisting of 0.19-inch thick, full length stainless steel containing 1.3% (minimum) Boron or 0.19-inch thick OFHC copper are required between the rod boxes.

(2) Two neutron absorber plates consisting of carbon steel, 0.035 inch in thickness, with 4 mils of Gd_2O_3 (minimum 0.02 gm Gd_2O_3/cm^2) affixed to each side of the plate are required between the rod boxes.

(3) Two neutron absorber plates consisting of 0.19-inch thick carbon steel are required between the rod boxes.

(vii) Unirradiated, uranium dioxide, zircaloy clad fuel elements, with annular pellets at the top and bottom ends of the active fuel length. Two neutron absorber plates consisting of carbon steel, 0.035 inches in thickness, with a cermet Gd_2O_3 coating affixed to each side providing a total of 0.054 g-Gd_2O_3/cm^2 for both sides of the plate, are required between fuel elements. The fuel assemblies shall be held in place by at least 7 clamping frame arms. Specifications for the fuel elements are as follows:

Type	14x14	14x14 CE-1
Pellet diameter (nom), in	0.3444	0.3765
Annular pellet inner diameter (nom), in	0.172	0.183
Rod diameter (nom), in	0.4000	0.4400
Maximum active fuel length (nom), in	144	136.25
Solid pellet stack length, in	132	122.65
Annular pellet stack length at the top and bottom ends of the active fuel length, in	6	6.8
Rods/element	179	176
Maximum cross section, (nom), in sq	7.8	8.110
Maximum U-235/element, kg	18.1	18.6
Maximum U-235 enrichment, w/o	5.0	4.8

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

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

Two fuel elements

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

One fuel element

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

Two inner containers containing not more than 80 kilograms U-235

(c) Fissile Class I

6. 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.

7. 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 folding is used, the portion of the sheath that is folded back will be cinched with tape near its end to hold it in place, and the length will be such that when the assembly is loaded in the packaging, the folded sheath will be clamped in place in at least two grid locations. The top end of the bag may be gathered together and taped closed. However, the top end then will be slit on all four sides. The slits will run perpendicular to the axis of the assembly and will extend the inner distance between the top nozzle pads and spring clamps (approximately 60% of the length of each side). The slits will be made in a plane near that formed by the top of the pads and clamps.

8. Use of packaging fabricated after February 28, 1986, is not authorized.

9. The gross weight must not exceed 6,300 pounds for the RCC packaging, 7,200 pounds for the RCC-1 and RCC-3 packagings, and 8,400 pounds for the RCC-4 packaging.

). 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 Westinghouse supplements dated June 20, September 16, and September 19, 1991.

(b) The package must be prepared for shipment and operated in accordance with the operating procedures submitted with Westinghouse supplements dated June 20, September 16, and September 19, 1991.

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, 1996.

REFERENCES

Westinghouse Electric Corporation application dated December 20, 1985.

Supplements dated: April 28, July 1, 21, 1986; January 4, February 14, April 18, October 5, and November 30, 1989; March 5, April 17, June 20, September 16, September 19, and September 24, 1991; February 11, March 21, and May 27, 1994.

Department of Energy supplement dated: March 1, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUN 29 1994

NRC FORM 618
(8-86)
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
5580	5	USA/5580/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
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 assemblies of the following type,

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

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

(iii) DMC Power Unit with control rods installed and secured in place by holddown mechanism.

(2) Maximum quantity of material per package

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

(c) Fissile Class: III

Maximum number of packages per shipment: One (1)

6. Expiration Date: December 31, 1997.

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)

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: APR 29 1992

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
5607	8	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
EH-33.2
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.

5.(a) (3) Drawings

(i) The shipping case is constructed in accordance with DuPont Drawing Nos.: W716539, Rev. 0; 180191, Rev. 1; 180192, Rev. 0; 180193, Rev. 1; 180194, Rev. 0; 180197, Rev. 0; W716538, Rev. 0; 180195, Rev. 0; 180196, Rev. 0; and 180089, Rev. 0.

(ii) The cask is constructed in accordance with General Electric Drawing Nos.: 919D755, Rev. 0; 135C5202, Rev.0; 153F966, Rev. 0; and 106D3721, Rev. 0; or it is constructed in accordance with DuPont Drawing Nos.: W239534, Rev. 2*; 147214, Rev. 15; 147215, Rev. 2*; and 147216, Rev. 1.

(iii) The ANL insert is constructed in accordance with Argonne National Laboratory Drawing Nos.: W0147-0227-DD, Rev 7; W0147-0228-DD, Rev. 6; W0147-0229-DC, Rev. 6; W0147-0231-DD, Rev. 3; W0147-0234-DC, Rev. 4; and W0147-0312-DE, Rev. 2.

(iv) The TREAT Vessel insert is constructed in accordance with Westinghouse Hanford Company Drawing Nos.: H-3-39082, Sheets 1 through 4 and 6, Rev. 0, and Sheet 5, Rev. 1; H-3-36134, Sheet 1, Rev. 3 and Sheet 2, Rev. 2; and H-3-36823, Sheet 1, Rev. 1 and Sheets 2 through 4, Rev. 0.

(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 or TREAT Vessel insert. The clad fuel may contain small quantities of Na or NaK. The minimum cooling time must be no less than 150 days.

(ii) Irradiated clad fuel pins of uranium dioxide enriched to up to 3.0 w/o in U-235 contained within the ANL insert or TREAT vessel insert. Average exposure of fuel not to exceed 18 megawatt days per kilogram. The clad fuel may contain small quantities of Na or NaK. The minimum cooling time must be no less than 90 days.

(iii) Irradiated reactor components held within the container shown in Drawing No. W0147-0234-DC, Rev. 4.

*As provided in the April 12, 1983, supplement.

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

Internal decay heat not to exceed 208 watts, and:

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

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

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

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

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

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, 1998.

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; and February 3, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

NRC FORM 618
(3-85)
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
5740	4	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
Oak Ridge Field Office
P.O. Box 2001
Oak Ridge, TN 37831

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, 1½-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: June 30, 1996.

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; and June 4, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: AUG 07 1992

NRC FORM 618
(5-85)
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
5757	5	USA/5757/B( )F	1	2

2. PREAMPLE

a. This certificate is issued to certify that the packaging 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.

c. DOCKET NUMBER 71-5757

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: S5W Refueling Source

(2) Description

The S5W Refueling Source shipping container consists of two structures, one nested within the other, having an overall envelope of 5 feet, 5 inches diameter by 9 feet, 5-5/8 inches length. The outer structure, the shipping container, is a ring of polyethylene 11-1/2 inches thick with an OD of 5 feet 4 inches and length of approximately 5 feet 2 inches. The polyethylene is canned in a 1/2-inch thick carbon steel shell. The inner structure, the replacement and installation container, fits into the cavity of the outer structure. This assembly consists of a 6-1/2 inch OD, 79-5/8 inches long stainless central tube, which is plugged at both ends by machined stainless steel 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 is a attenuate the gamma radiation. A wall of polyethylene, 8-1/2 inches thick, surrounds the lead shield and is canned with a 1/2-inch thick carbon steel plate. Gross weight is approximately 19,000 pounds.

(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) Fissile Class I.

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

10. Expiration date: December 31, 1997.

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; and Naval Reactors letter G#92-03738, dated October 15, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 12 1992

NRC FORM 618
(5-85)
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
5796	13	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 26, 1992, 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 guage 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 x39.75"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. as specified in Section 1.3.1 (p 1-11) of the application.

(ii) The Model No. 181361 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos. as specified in Section 1.3.2 (p 1-12) of the application.

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, 1997.

REFERENCES

Advanced Medical Systems, Inc. application dated June 26, 1992.

Supplements dated: August 13 and October 15, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: DEC 16 1992

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
5797	10	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
EH 33.2
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, 1-inch high, Douglas 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. C, and M-20978-EL-008E, Rev.B.

(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. C, and M-20978-EL-008E, Rev.B.

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. M; 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. J; 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) Fissile Class I

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: October 31, 1996.

REFERENCES

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

Supplement dated: February 26, 1992, and April 2, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUN 24 1993

NRC FORM 618
(9-86)
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
5805	16	USA/5805/B( )	1	3

PREAMBLE

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

71-5805

c. DOCKET NUMBER

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 3-55

(2) Description

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

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

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

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.

..(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, 1999.

REFERENCES

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

APR 05 1994

Date _____

NRC FORM 618
(6-85)
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
5830	5	USA/5830/B( )	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 Support Force Antarctica
FPO San Francisco, CA 96601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

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

c. DOCKET NUMBER 71-5830

4. CONDITIONS

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

5

(a) Packaging

(1) Model No.: SNAP-21

(2) Description

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

(3) Drawings

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

Page 2 - Certificate No. 5830 - Revision No. 5 - Docket No. 71-5830

5. (b) Contents

(1) Type and form of material

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

(2) Maximum quantity of material per package

33,000 ci

6. 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, 1995.

REFERENCE

Minnesota Mining and Manufacturing Company application dated June 28, 1968.
Department of Navy supplements dated June 4 and October 10, 1968.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 2 1988

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
5862	6	USA/5862/B( )	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 application dated June 26, 1985, as supplemented.

c. DOCKET NUMBER 71-5862

4. CONDITIONS

This certificate 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

(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.

Expiration date: September 30, 1995.

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.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 16 1993

NRC FORM 618
(9-86)
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
5874	6	USA/5874/B( )F	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis for Radioactive Material Shipping Cask No. WAPD-40 dated December 1984, as supplemented.

c. DOCKET NUMBER 71-5874

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: WAPD-40

(2) Description

The WAPD-40 shipping container is a cylindrical, stainless steel clad, lead shielded, shipping container used to ship irradiated fuel and non-fuel test specimens. The container has an outer Type 304 stainless steel shell 1/2-inch thick and an inner Type 304 stainless steel shell 1/4-inch thick, with 9.875 inches of lead between the shells. The overall size of the container, including an integral skid, is 23.25 inches in diameter by 158 inches in length. Gross weight (including skid) of the container is approximately 28,000 pounds. The heat removal capacity is approximately 2000 BTU/hour. The cylindrical inner cavity is 2 inches in diameter and 135 inches in length. Inner containers are required for all shipments. Stainless steel clad, lead shielded end plugs bolt into each end. One-half inch thick plates are bolted over the end plugs to provide a total end plug flang thickness of 1.0 inch for puncture resistance. Metallic, pressure-filled O-rings between the end plugs and the container seal the package. The cask may be wrapped in polyvinyl chloride when shipped in a closed truck. A special holddown cradle is used during truck shipments. This cradle weighs approximately 5,000 pounds.

(3) Drawings

The WAPD-40 cask is fabricated in accordance with Westinghouse Electric Drawing Nos. 936F577, Rev. 11; and 936F578, Sheet 1, Rev. 9, and Sheet 2, Rev. 4.

Page 2 - Certificate No. 5874 - Revision No. 6 - Docket No. 71-5874

5. (b) Contents

(1) Type and form of material

Byproduct and special nuclear material contained within inner product containers. The contents must be dry and unmoderated (H to X atomic ratio less than 2).

(2) Maximum quantity of material per package

The fissile content of the cask 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.

(c) Fissile Class II

Minimum transport index to be shown on label 3.2

6. Maximum decay heat per package must not exceed 2,000 BTU/hr.

7. As needed, shoring must be used to limit movement of contents under accident conditions of transport.

8. The lifting trunnions must be covered during transport to preclude their use as tie-down devices.

9. The contents of the container must be limited so that the maximum measured gamma dose rate (above background) on the side of the cask for normal conditions does not exceed the value defined by $C_S = (1000-N_A)/F$.

where C_S = the maximum permissible gamma dose rate on the side of the cask in mrem/hour for normal conditions.

N_A = 0.0 mrem/hour for shipments of irradiated structural materials and 37.0 mrem/hour for shipments of irradiated fuel.

F = factor obtained directly from Table 1 or Table 2 (attached).

For non-fuel whose principal isotope is not included in Table 1, an F factor must be determined based on calculated ratios of the limiting accident radiation levels to the normal condition radiation levels for each of the principal isotopes.

For U-233 with approximately 30,000 hours of effective full power operation and greater than 17,520 hours of decay, the F factors in Table 2 for U-235 are conservative and may be used.

The maximum measured neutron level dose rate on the side of the cask must not exceed 10.7 mrem/hour for normal conditions.

CONDITIONS *(continued)*

9. Continued

For mixed shipments of fuel and irradiated non-fuel, the more limiting C_S value must be employed.

If C_S is below the maximum measurable level of the gamma instrument, other methods (e.g., thermal luminescent detectors, source strength calculations) must be employed to estimate the expected level for comparison with C_S.

10. The acceptance tests and maintenance program must be in accordance with Chapter 8.0 to WAPD-REO(C)-270, Rev. 3.

11. The packaging must be leak tested within one year prior to use to a minimum sensitivity of 1×10^{-7} std-cm^3/sec.

12. Prior to each shipment, the package must be leak tested after assembly to a minimum sensitivity of 1×10^{-3} std-cm^3/sec.

13. The WAPD-40 shipping container may be covered with a wrapping of polyvinyl chloride (PVC) during shipment provided that the internal heat load of the shipment does not exceed 2000 BTU/hr and the shipment is made in a closed truck. The applicable requirements of Condition No. 9 above must be satisfied prior to wrapping.

14. Expiration date: July 31, 1997.

REFERENCES

Safety Analysis for Radioactive Material Shipping Cask No. NRBK-40 dated December 1984 (WAPD-REO(C)-270, through Rev. No. 4).

Naval Reactors supplements dated: July 3, 1985 (S#85-1328), May 6, 1987 (S# 87-2721), and November 18, 1991 (S#91-02,620).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: APR 1 1992

Table 1

F Factors[1] For Use in Formula $C_S = (1000-N_A)/F$

For Irradiated Structural Material Shipments by

Principal Isotope

Isotope	Energy (MeV)	and	Yield (γ/decay)	Factor
Manganese-56	0.47		0.99	174
	1.81		0.29	
	2.11		0.15	
Cobalt-60	1.17		1.0	1492
	1.33		1.0	
Iron	1.095		0.56	1875
	1.292		0.44	

[1]The F factor is a constant for each isotope because the energy spectrum of the emitted gamma radiation of each isotope does not change as a function of time.

Table 2

F Factors For Use in Formula $C_S = (1000-N_A)/F$

For Irradiated U-235 Fuel Shipments

Effective Hours Full Power Operation	Hours Decay								
	720	1440	2160	4320	6480	8760	17,520	43,800	87,600
100	339	339	330	219	200	194	192	208	698
500	338	338	325	219	203	198	198	237	648
1000	338	337	318	219	206	203	206	268	629
5000	332	317	283	230	228	229	250	382	606
10,000	317	300	271	242	243	248	278	427	607
15,000	310	294	269	249	253	258	292	445	610
20,000	306	290	268	254	257	265	300	457	612
25,000	302	286	268	256	260	267	305	464	617
30,000	300	285	267	257	263	270	308	466	624
40,000	295	282	266	258	264	271	310	472	637
50,000	292	279	265	259	264	272	311	472	651

NRC FORM 618
(9-83)
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
5894	5	USA/5894/AF	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 2.7 New Fuel Shipping Container dated July 15, 1968, as supplemented.

c. DOCKET NUMBER 71-5894

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 2.7 New Fuel

(2) Description

The Model No. 2.7 New Fuel container was designed to ship and store new and unirradiated S5W Core R2 fuel modules. Adapters are used to permit additional shipments of S5W Core R3, A1W Cor R2, and S1C Type I fuel modules. The container assembly consists of two major components, an inner container which holds the fuel module and an outer container which supports the inner container. The steel outer container is approximately 24.5 inches wide by 24.5 inches high and 128 inches long. The cross section of the outer container is octagonal, the steel shell thickness is 0.1875 inch ASTM A 283 GR.B. The outer shell is surrounded by a framework of steel stiffeners and rails. The inner container is constructed from Type 304 CRES plates, 0.1875 inch thick and is 7.76 inches square and 99 inches long. Bolted closure is provided for each container. The gross weight of the package ranges from approximately 1,500 to 2,000 pounds.

CONDITIONS *(continued)*

Page 2 - Certificate No. 5894 - Revision No. 5 - Docket No. 71-5894

(3) Drawing

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

5. (b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following type:

(i) S5W Core R2 standard module or corner module;

(ii) S5W Core R3 standard module or corner module;

(iii) A1W Core R2 standard cluster or half cluster;

(iv) S1C Core Type I standard cluster;

(v) S1C Core Type I fuel subassembly;

(vi) S5W Core 2 standard module or corner module;

(vii) A1W Core R2 subassembly.

(2) Maximum quantity of material per package

(i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv) or 5(b)(1)(vi).

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

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

(c) Fissile Class III

Maximum number of packages per shipment:

For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iv), 5(b)(1)(v) and 5(b)(vi) and limited in 5(b)(2)(i) and 5(b)(2)(ii):	No more than one total core's worth

CONDITIONS *(continued)*

(2) For the contents described in 5(b)(1)(iii) and 5(b)(1)(vii) and limited in 5(b)(2)(i) and 5(b)(2)(iii): 25 total, with the number of packages as described in 5(b)(1)(vii) and limited in 5(b)(2)(iii) not to exceed four

6. Expiration date: July 31, 1997.

REFERENCE

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

Supplements: Bettis Atomic Power Laboratory letters WAPD-OP-(R)S-2800 dated September 3, 1968, WAPD-OP(R)C-3425 dated August 14, 1969; and Department of Energy letters G#6291 dated July 13, 1979, and G#92-03424 dated March 20, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: APR 30 1992

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
5926	15	USA/5926/B( )F	1	3

PREAMBLE

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

Minimum transport index to be shown on label Contents 5.(b)(1)(i): 5.6

6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.

7. At the time of delivery of the loaded package to a carrier for transport, the package contents shall be dry and the fissile material unmoderated (H to X atomic ratio less than 2).

8. 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: February 28, 1998.

REFERENCES

General Electric Company application dated January 18, 1993.

Supplements dated: March 3, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
and Medical Nuclear Safety, NMSS

Date: MAR 10 1993

NRC FORM 618
(5-89)
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	26	USA/5939/B( )F	1	4

1. PREAMBLE
   a. This certificate is issued to certify that the packaging 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.

CONDITIONS *(continued)*

Page 2 - Certificate No. 5939 - Revision No. 26 - Docket No. 71-5939

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) Fissile Class III

Maximum number of packages per shipment 22

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

   (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: December 31, 1997.

REFERENCES

General Electric Company application dated November 19, 1992.

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Dated: APR 1 1993

NRC FORM 618
(8-83)
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
5950	6	USA/5950/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)

Battelle Columbus Laboratories
505 King Avenue
Columbus, OH 43201

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Battelle Columbus Laboratories application dated August 21, 1981.

c. DOCKET NUMBER 71-5950

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: BCL-4

(2) Description

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

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

(3) Drawing

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

5. (b) Contents

Type and form and maximum quantity of material per package.

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

Inner can assembly:

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

Fissile Class I	650*
Fissile Class III	2000*

*(grams U-235 equivalent mass)

(c) Fissile Class I and III

Maximum number of packages per shipment for Class III One (1)

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

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

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

8. The maximum gross weight of the cavity contents must not exceed 180 pounds (inner can assembly, radioactive material, etc.).

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

(a) Each package must meet all of the acceptance and periodic tests specified in Section 8.0 of the application.

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

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

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

CONDITIONS *(continued)*

Page 3 - Certificate No. 5950 - Revision No. 6 - Docket No. 71-5950

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

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

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

13. Expiration date: August 31, 1996.

REFERENCES

Battelle Columbus Laboratories application dated August 21, 1981.

Supplement dated: July 26, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: AUG 2 0 1991

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5957	23	USA/5957/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*)

Department of Energy
Office of Facility Safety
Analysis, EH-32
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Battelle Columbus Laboratories application dated June 20, 1985, 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.

Page 2 - Certificate No. 5957 - Revision No. 23 - Docket No. 71-5957

5. (a) Packaging (continued)

(4) Product Containers

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

(i) Inner can assembly as shown in BMI Drawing No. 00-000-421, Rev. C.

(ii) Basket Assembly as shown in BMI Drawing Nos. BCL-000-500, Rev. A; BCL-000-501, Rev. A; and 0048, Rev. A.

(iii) Fermi Fuel Element copper casting assembly as shown in BMI Drawing No. 5928-5 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 No. 00-000-236, Rev. C, and BCL-000-502, Rev. B.

(vi) Basket Assembly and storage can defined by BMI Drawing No. 00-000-301, Rev. [illegible] Atomic International Drawing No. AIHL, S8DR-0018-01, 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.

(b) Contents

(1) Type and form of material

(i) Intact irradiated MTR- or BRR-type fuel assemblies containing not more than 200 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

Page 3 - Certificate No. 5957 - Revision No. 23 - Docket No. 71-5957

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 SSBR fuel elements, 0.56-inch OD by 18.7 inches long by 0.010-inch wall thickness Hastelloy-N. The fuel material is UZrH fully enriched [illegible].

(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.

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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 partitioned only by the non-fuel bearing regions of the assembly.

(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).

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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 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 [illegible]98 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.

5. (b) Contents (Continued)

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

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

Twenty-four (24) capsules each limited to 100 grams U-235.

(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 140 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.

(c)	Fissile Class	I and III
	(1) Class I	For the contents specified in 5(b)(1)(iii) and 5(b)(1)(xv), and limited in 5(b)(2)(iii) and 5(b)(2)(xv).
	(2) Maximum number of packages per shipment as Fissile Class III	For the contents specified in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(x), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), and 5(b)(1)(xvi), 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), and 5(b)(2)(xvi): One (1) package.

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

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

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

7. Except for 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 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.

    (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: June 30, 1996.

REFERENCES

Battelle Columbus Laboratories consolidated application dated June 20, 1985.

Cintichem Inc. supplements dated December 14, 1987; May 30, July 15 and September 28, 1988; and April 17, 1990.

University of Missouri Research Reactor letters dated April 18, June 7, June 11, June 13, and August 8, 1990.

Massachusetts Institute of Technology Nuclear Reactor Laboratory letters dated October 19, 1992, and January 11, 1993.

Department of Energy supplements dated: July 15 and September 16, 1993; March 2, May 2, and April 7, 1994; and January 23, 1995.

National Institute of Standards and Technology supplements dated July 15, 1994, and April 4, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Carl R. Chappell, Section Leader
Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 7, 1995

NRC FORM 618
(8-95)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5979	8	USA/5979/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)*

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 stairs across the bottom facilitate use of a fork-lift and lifting lugs are provided at the four top corners. The inner shield vessel is essentially a 24" diameter, lead-filled, barrel-shaped configuration. Three different cylindrical plug inserts and bolted end caps provide flexibility to accommodate several sizes and shapes of sources. Gross weight is approximately 5,000 lbs.

(3) Drawings

The packaging is constructed in accordance with Alpha-Omega Services, Inc. Drawing Nos.: 0090, Rev. 0; 0091, Rev. 0; 0092, Rev. 0; and 0093, Rev. 0.

5. (b) Contents

(1) Type and form of material

Cobalt 60 or cesium 137 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

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 and 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, 2000.

REFERENCES

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

Supplement dated: April 12, 1983, May 22 and August 20, 1990, and January 30, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 03/21/95

NRC FORM 618
(6-89)
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	5	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 Type A packaging. The overpack consists of a vented-steel jacketed, laminated plywood outer container. Dimensions of the overpack are approximately 28" in diameter by 43" high and the plywood thickness is approximately 4" on the sides and 6" on the top and bottom. The total weight including weight of the contents is approximately 1,780 pounds.

(3) Drawings

The overpack is constructed in accordance with J. L. Shepherd and Associates Drawing Nos. A-0068-2C-1 and A-0068-2C.

The inner shielded container is constructed in accordance with J. L. Shepherd and Associates Drawing No. A-0068-1B or DOT Specification 7A packaging. The special form source capsule is constructed in accordance with J. L. Shepherd and Associates Drawing No. A-0068-10.

5. (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. Contents must be positioned within a single snug-fitting, shielded Type A packaging within the protective overpack. The Type A packaging must have a metal outer wall and meet the requirements of DOT Specification 7A packaging.

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

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 "Procedures for Removal of DOT 7A Packaging from Overpacks" in the J. L. Shepherd and Associates submittal dated February 20, 1990.

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.

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, 1995.

REFERENCES

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

Supplements dated: January 20, 1975; and February 20, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAR 21 1990

NRC FORM 618
(8-86)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6003	16	USA/6003/B( )F	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*)

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.

5.(a) Packaging (cont'd)

(2) Description (cont'd)

The container is supported on its transport vehicle by an "A" frame structure. Gross weight of the loaded container without its support structure is approximately 228,000 pounds.

(3) Drawings

The packaging is constructed in accordance with General Electric Drawing Nos. 247E209, Sheet 1, Rev. R; Sheet 2, Rev. K; Sheet 3, Rev. T; Sheet 4, Rev. U; Sheet 5 of 5, Rev. F and 247E228, Rev. F.

(b) Contents

(1) Type and form of material

Irradiated fuel assemblies, activated corrosion products and structural parts containing up to 40 gallons of residual contaminated water. The fuel assemblies and structural parts are of the following types:

(i) S3W/S4W fuel subassemblies of core type 2.

(ii) S5W fuel modules of core types 2 or 3.

(iii) S5W corner fuel modules of core types 2 or 3.

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

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

(vi) S1C/S2C fuel modules with control rods.

(vii) S1C/S2C peripheral fuel modules.

(viii) S3G-3/3A fuel module with or without control rods.

(ix) SAD cell.

5. (b) Contents (cont'd)

(1) Type and form of material (cont'd)

(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) S5W-4A recoverable irradiated fuel modules with control rod.

(xiv) S7G recoverable irradiated fuel cells.

(xv) D2W fuel cells with control rods.

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

(xvii) ATC fuel modules with or without control rods.

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

(2) Maximum quantity of material per package.

(i) 52 fuel assemblies as described in 5(b)(1)(i).

(ii) 12 fuel assemblies as described in 5(b)(1)(ii) or 9 fuel assemblies as described in 5(b)(1)(ii) and 4 fuel assemblies as described in 5(b)(I)(iii).

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

(iv) 9 fuel assemblies as described in 5(b)(1)(vi) and 8 fuel assemblies as described in 5(b)(1)(vii).

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

(vi) 9 fuel assemblies as described in 5(b)(1)(viii) and one fuel assembly as described in 5(b)(1)(ix).

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

5. (b) (2) Contents (cont'd)

(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) 6 fuel assemblies as described in 5(b)(1)(xiii).

(x) 8 fuel cells as described in 5(b)(1)(xiv).

(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) 10 fuel modules as described in 5(b)(1)(xvii).

(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) Shipment of contents specified in 5(b)(1)(vi) and 5(b)(1)(vii) and limited in 5(b)(2)(iv) shall be made in a stainless steel M-130 container and shall have a decay heat load not to exceed 18,960 Btu/hr per shipment.

(iii) Shipment of contents specified in 5(b)(1)(viii), 5(b)(1)(ix) and 5(b)(1)(x) and limited in 5(b)(2)(v), 5(b)(2)(vi) and 5(b)(2)(vii) shall be made at a time after shutdown as determined from Bettis Atomic Power Laboratory report WAPD-OP(PP)S-4401 dated June 29, 1979 and shall have a decay heat load not to exceed 28,620 Btu/hr for the shipboard core and 30,000 Btu/hr for the prototype core.

(iv) Shipment of contents specified in 5(b)(1)(i), 5(b)(1)(ii) shall be made no earlier than 72 days after shutdown and shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.

(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) Shipment of contents specified in 5(b)(1)(xiii) and limited in 5(b)(2)(ix) shall have a heat load not to exceed 23,800 Btu/hr and shall be made no earlier than 92 days after shutdown.

5. (b) (3) Contents (cont'd)

(vii) Shipment of contents specified in 5(b)(1)(xiv) and limited in 5(b)(2)(x) shall have a heat load not to exceed 22,400 Btu/hr and shall be made no earlier than 122 days after shutdown.

(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) Shipment of contents specified in 5(b)(1)(xvii) and limited in 5(b)(2)(xiii) shall have a heat load not to exceed 27,400 Btu/hr and shall be made no earlier than 195 days after shutdown.

(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) Fissile Class — III

Maximum number of packages per shipment:

Except for the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(v)	One (1)
For the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(v)	Two (2)

6. For shipments involving the contents specified in 5(b)(1)(ii) or 5(b)(1)(iii) the Model No. M-130 package shall be inspected to verify that boron poison plates are in the module holders.

7. For shipments involving the contents specified in 5(b)(1)(viii), 5(b)(1)(ix) or 5(b)(1)(x) the thermocouples and thermocouple cases if included or the vacant module holder shall be located in the mid-position of either cage and module holder assembly.

8. Shipments shall be made in the dry condition, except for residual water as limited in 5(b)(1).

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 NR-1 shipments only.

13. For shipments involving the contents specified in 5(b)(1)(xvii) which do not contain a full complement of fuel modules (i.e. one position is occupied by either two flux thimbles or a vacant fuel module holder with pocket shield plug), that position shall be located in the middle module holder of either half of the cage assembly.

14. Expiration date: December 31, 1997.

REFERENCES

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

Supplements: Naval Reactors letters A#2256 dated February 24, 1969 and G#1931 dated March 3, 1969; General Electric Company letter ONP-74520-526 dated April 3, 1972; Naval Reactors letter G#3207 dated April 27, 1972; General Electric Company letter ONP-74520-528 dated April 28, 1972; Naval Reactors letter G#3250 dated June 6, 1972; General Electric Company letters ONP-74570-635 dated October 25, 1972; ONP-74570-654 dated December 4, 1972; ONP-14570-666 dated December 12, 1972; ONP-74570-682 dated January 12, 1973; ONP-74570-698 dated January 31, 1973: ONP-74570-687 dated February 6, 1973; ONP-74390-65 dated March 26, 1973; DLGN-85570-854 dated September 24, 1973; DLGN-85570-901 dated January 10, 1974; Naval Reactors letter G#4061 dated January 29, 1974; General Electric Company letters DLGN-85570-924 dated February 15, 1974; DLGN-85570-923 dated March 6, 1974; DLGN-85570-969 dated May 24, 1974; Naval Reactors letter G#4991 dated November 25, 1975; General Electric Company letters ONP-74340-JTT-73 dated December 17, 1975; CGN-85570-1145 dated September 9, 1976; CGN-85570-1146 dated September 10, 1976; CGN-85570-1148 dated September 14, 1976; Bettis Atomic Power Laboratory letter WAPD-R(K)-1378 dated August 30, 1976; WAPD-OP(PP)S-4401 dated June 29, 1979; Naval Reactors letters G#6197 dated July 13, 1979; G#7136 dated March 17, 1982; Naval Reactors letter G#7022 dated July 14, 1981 and WAPD-LD-(CES)SE-181 dated September, 1981; WAPD-LP(CES)SE-96 dated February, 1982, WAPD-LP-(CES)SE-170 dated July 1981; Naval Reactors letter G#7160 dated May 18, 1982; Naval Reactors letter G#7582 dated September 7, 1983; Naval Reactors letter G#C87-5692 dated September 2, 1987; Naval Reactors letter G#C87-5689 dated September 23, 1987; and Naval Reactors letters G#C87-8008 dated January 19, G#C88-5931 dated May 12, and G#C88-5961 dated July 25, 1988. Naval Reactors letter G#C89-2803 dated August 11, 1989; Naval Reactor letter G#C89-2825 dated March 29, 1989; Naval Reactors letter G#C92-03392 dated March 30, 1992; Naval Reactors letter G#92-03729 dated October 20, 1992; and Naval Reactors letter G#C93-10935 dated October 8, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JAN 13 1994

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
6058	11	USA/6058/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
Transportation and Packaging
Safety Division, EH-33.2
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.

(c) Fissile Class II

For contents containing special nuclear material:

Minimum transport index to be shown on label 10.0

6. For gamma-emitting special form materials, at least 5 inches of additional lead shielding 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, 1995.

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.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 13 1993

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
6078	20	USA/6078/B( )F	1	3

1. PREAMBLE

a. This certificate is issued to certify that the packaging 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)*

Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, CT 06095-0500

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Combustion Engineering application dated May 25, 1990, as supplemented

c. DOCKET NUMBER 71-6078

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: 927A1 and 927C1

(2) Description

A steel fuel bundle shipping container consisting of a strongback and fuel bundle clamping assembly, shock mounted to a steel outer container. 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 8,300 lbs.

(3) Drawing

The Model Nos. 927A1 and 927C1 containers are constructed in accordance with Combustion Engineering, Inc. Drawing No. NFM-E-4108, Sheets 1 through 4, Rev. 11.

(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.

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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 19.84 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 20.77 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. 972C1: Two fuel bundles weighing not more than 1506 lbs. each.

(c) Fissile Class III

Maximum number of packages per shipment Eight (8)

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

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

9. Expiration date: October 31, 2000.

REFERENCES

Combustion Engineering, Inc. application dated May 25, 1990.

Supplements dated: September 28, 1990; September 20 and October 7, 1991; October 13, October 27, November 20, and December 18, 1992; June 28, 1993; September 1, 1994, and August 18, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

James R. Chappell

James R. Chappell, Section Leader
Licensing Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: SEP 13 1995

NRC FORM 618
(5-85)
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
6142	5	USA/6142/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
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Bettis Disposable Waste shipping container dated September 30, 1969.

c. DOCKET NUMBER 71-6142

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: Bettis Disposable Waste

(2) Description

The packaging consists of a disposable concrete vault enclosed in a reusable steel overpack. The concrete vault is a poured concrete block measuring 51" square by 49" high. The inner cavity is centered in the vault and may be one of two sizes: 15" square by 16" deep or 27" square by 28" deep. The smaller cavity is surrounded by 18" of structural concrete on the bottom and sides and by 15" on the top; the larger cavity is surrounded by 12" on the bottom and sides and by 9" on the top. The overpack is a weldment of 2-1/2" by 5" rectangular steel tubes to 1/2" steel plate and is sized and constructed to snugly enclose the concrete vault. The lid is similarly constructed and is secured to the overpack by a bolted and gasketed closure. The overall dimensions of the package are 64" square by 60.5" high. The gross weight is approximately 16,000 pounds.

(3) Drawing

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 945F976, Rev. 4; 930C940, Rev. 4 and 976C870, Rev.

(b) Contents

(1) Type and form of material

Radioactive material in the form of waste material packaged in smaller cans or pails or as unpackaged solid waste sealed in poured concrete.

(2) Maximum quantity of material per package

Total radioactivity per package shall not exceed five times an A_2 quantity and the plutonium activity per package shall not exceed two times an A_2 quantity. The total fissile material per package must be less than the exempt quantities defined in 10 CFR §71.53.

6. Only reusable steel overpacks fabricated before August 31, 1986, are authorized for use.

7. The lid of the vaults shall be poured in such a manner that both packaged and unpackaged waste are sealed in concrete. In addition to the 9 inches of structural concrete specified in section 5(a)(2) of this certificate for the top (lid) of a large cavity vault, an additional concrete thickness of at least 3 inches shall be poured so that the vault cavity and its contents are surrounded by at least 12 inches of structural concrete.

8. Expiration date: December 31, 1997.

REFERENCE

Safety Analysis Report for Bettis Disposable Waste shipping container, WAPD-O(AO)-5029 dated September 30, 1969.

Supplements dated: July 27, 1982, and June 8, and December 18, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAR 3 1993

NRC FORM 618
(9-83)
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
6206	19	USA/6206/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*)

B&W Fuel Company
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.

c. DOCKET NUMBER 71-6206

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: Model B

(2) Description

A fuel assembly shipping container consisting of a steel strongback clamping assembly, shock mounted to a steel outer container. Two, 3/16-inch thick, 8-5/8-inch high and full length stainless steel plates containing 1.5% minimum boron are positioned between adjacent fuel assemblies. The outer container is approximately 40 inches in diameter by 200 inches long. Gross weight of the loaded container not to exceed 7,600 pounds.

(3) Drawings

The container is constructed in accordance with Babcock and Wilcox Company Drawing Nos. PE-52F, Rev. 4; PE-53F, Rev. 3; and PE-54F, Rev. 2.

(b) Contents

(1) Type and form of material

Unirradiated, sintered UO_2 pellets in fuel rods with a minimum Zircaloy clad thickness of 0.020 inches. The rods are assembled into fuel assemblies. The fuel assemblies may contain inserted control rod assemblies.

5. (b) Contents (continued)

(i) Fuel assemblies as described above, with uranium enriched to a maximum 4.6 w/o in the U-235 isotope. The assemblies have the following specifications:

Type	15x15	15x15	17x17	15x15	15x15	17x17	15x15
No. fuel rods	208	208	264	204	204	264	204
No. non-fuel tubes	17	17	25	21	21	25	21
Fuel rod pitch, in.	0.568	0.568	0.501	0.563	0.563	0.496	0.5625
Maximum fuel pellet OD, in.	0.3742	0.3622	0.3252	0.3671	0.3622	0.3232	0.3672
Cladding OD, in.	0.43	0.416	0.379	0.422	0.416	0.374	0.422
Tube material	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4	SS-304
Maximum active fuel length, in.	144	144	144	144	144	144	119
Maximum U-235 Loading (kg)	23.39	22.89	22.42	22.08	21.47	22.15	18.24

(ii) Fuel assemblies as described above, with uranium enriched over 4.6 to a maximum 5.0 w/o in the U-235 isotope. The assemblies have to following specifications:

Type	15x15	15x15	17x17	15x15	15x15	17x17	15x15
No. fuel rods	208	208	264	204	204	264	204
No. non-fuel tubes	17	17	25	21	21	25	21
Fuel rod pitch, in.	0.568	0.568	0.501	0.563	0.563	0.496	0.5625
Maximum fuel pellet OD, in.	0.3742	0.3622	0.3252	0.3671	0.3622	0.3232	0.3672
Cladding OD, in.	0.43	0.43	0.379	0.422	0.416	0.374	0.422
Tube material	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4	SS-304
Maximum active fuel length, in.	144	144	144	144	144	144	119
Maximum U-235 Loading (kg)	25.93	24.27	24.86	24.48	23.81	24.55	20.22

Page 3 - Certificate No. 6206 - Revision No. 19 - Docket No. 71-6206

5. (b) Contents (continued)

(2) Maximum quantity of material per package

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

Two fuel assemblies

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

One fuel assembly

5. (c) Fissile Class

Maximum Number of packages per shipment 20

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

7. There must be a bow clamp to restrain each spacer grid end fitting. The ratio of assembly weight to the number of clamp bows must not exceed 1,000 pounds per clamp.

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, 2000.

REFERENCES

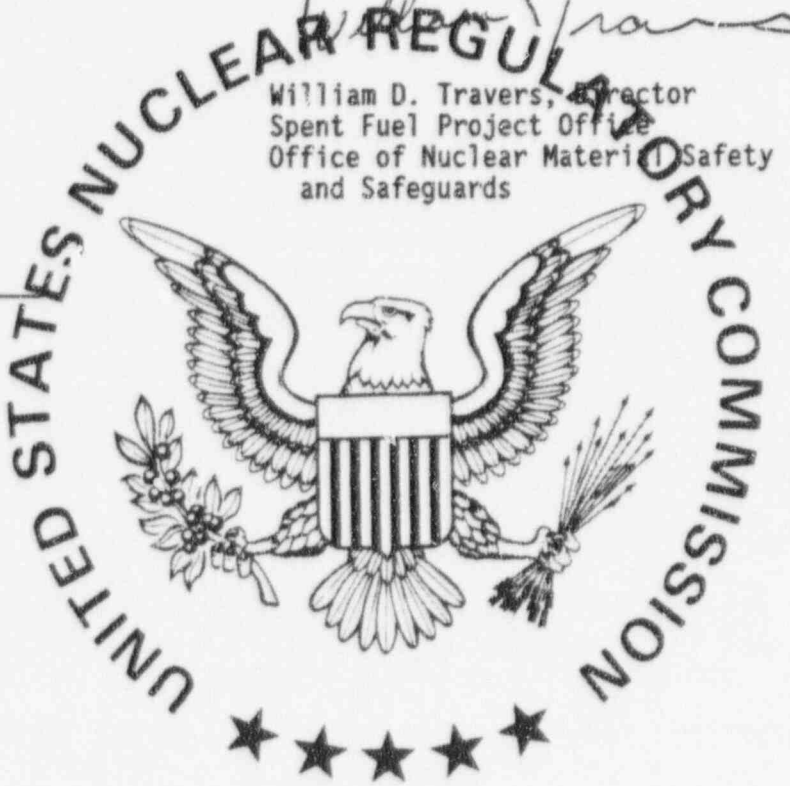
B&W Fuel Company application dated April 23, 1990.

Supplements dated: July 23, 1990; May 4, August 18, August 25, and October 14, 1992; September 24, 1993; and April 3, May 2, and November 23, 1994; and February 26, March 17, April 7, and July 31, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: SEP 25 1995



NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6244	9	USA/6244/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 May 14, 1984, as supplemented.

c. DOCKET NUMBER

71-6244

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 4-85

(2) Description

The package consists of a steel and lead shielded cask. The cask is positioned within an overpack constructed of steel and honeycomb material. The gross weight of the package is 46,000 pounds.

The mild steel cask is approximately 111-1/2 inches in length and 58 inches in diameter. The walls, top, and bottom are of 2-inch thick steel plate. Shielding is provided by 2 inches of lead within the walls and 2-inch thick steel walls of the cask. The cask lid is secured to the cask body by twenty-four, 3/4-inch diameter bolts and is sealed by a compressible polyurethane seal. Lifting devices are attached to the lid and body of the cask.

The cask is positioned within an overpack approximately 139-1/2 inches in overall length and 89-3/8 inches in diameter. Aluminum honeycomb material is confined by an outer steel shell 3/8-inch thick and an inner steel shell of 1/4-inch thickness. The overpack cover is of the same construction as the rest of the overpack and is secured to the walls by eight, 5/8-inch diameter bolts. Lifting devices are welded to the outer shell of the overpack cover.

(3) Drawings

The package is constructed in accordance with Nuclear Waste Systems Drawing No. D-6930-1, Rev. F (Sheet 1 of 2) and Chem-Nuclear Systems Drawing No. D-6930-1, Rev. E. (Sheet 2 of 2).

5.(b) Contents

(1) Type and form of material

(i) Greater than Type A quantity of byproduct material as process solids, either dewatered, solid, or solidified, in secondary container(s) which meet the requirements for DOT Specification 7A packaging; or

(ii) Greater than Type A quantity of byproduct material as solid metal components in secondary containers, as required.

(2) Maximum quantity of material per package

Not to exceed 10 thermal watts of byproduct material. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded. 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, a 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% of the volume (or equivalent limits for other flammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.053 g-moles/ft3 at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

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

(b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of separation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. The lifting lugs on the outside of the overpack shall be covered during transport to prevent their accidental use for the purpose of tie-down or lifting.

8. Shoring shall be placed between the secondary containers (or activated components) and the cask cavity to minimize movement during normal conditions of transport.

9. The package shall be prepared for shipment and operated in accordance with the operating procedures in Chapter 7 of the application as supplemented.

10. Each package must be maintained in accordance with the maintenance program in Chapter 8 of the application as supplemented.

11. Fabrication of additional packaging after August 31, 1984, 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: April 30, 2000.

REFERENCES

Chem-Nuclear Systems, Inc. application dated May 1[illegible], 1984.

Supplements dated: August [illegible], 1988; July 20, 1989; and September [illegible], 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date 04/13/95

NRC FORM 618
(5-85)
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
6280	6	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: January 31, 2000.

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, and December 6, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: 01/11/95

NRC FORM 618
(8-89)
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
6294	20	USA/6294/AF	1	3

2. PREAMBLE

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

Combustion Engineering, Inc.
P.O. Box 107
Hematite, MO 63047

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

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

c. DOCKET NUMBER 71-6294

4. CONDITIONS

This certificate 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 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) Fissile Class

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

Fissile Class	II and III
Minimum transport index to be shown on label for Class II	0.5
Maximum number of packages per shipment for Class III	216

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

Fissile Class	II
Minimum transport index	1.3

6. Prior to each shipment the insert (containment vessel) gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

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. 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.

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

... Expiration date: September 30, 1995.

REFERENCES

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

Supplements dated: October 19, 1990; January 27, and July 28, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Nancy L. Osgood

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

Date: AUG 0 1 1994

NRC FORM 618
(8-89)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6346	24	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)

Public Service Company of Colorado
2420 W. 26th Avenue, Suite 100D
Denver, CO 80211

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Public Service Company of Colorado application dated April 11, 1990, 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

A stainless steel encased, depleted uranium shielded cask. The cask body is a cylinder 208 inches long and 70 inches in diameter, except for the top flange area which is 77 inches in diameter. The cavity is approximately 77.7 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 twenty-four 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 twelve 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 twenty-four 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.: 700[illegible] Rev. 7; [illegible]0296F, Rev. 2; and General Atomics Drawing No. 150T-003, Rev. C.

Configuration B

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

Configuration 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 total.

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 lbs. The gross weight of the cask cavity contents, including the component spacers, inner containers 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 lbs. Contents must be shipped in Configuration 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 Configuration F or G.

5. (c) Fissile Class III

Maximum number of packages per shipment One (1)

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 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.

(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 (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.

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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: April 30, 1996.

REFERENCES

Public Service Company of Colorado application dated April 11, 1990.

Supplements dated: June 28, and November 2, 1990; March 27, 1991; March 30, 1992; and October 19, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date NOV 30 1994

NRC FORM 618
(8-89)
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	7	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
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.

Page 2 - Certificate No. 6347 - Revision No. 7 - Docket No. 71-6347

5. (b) Contents

(1) Type and form of material

Fuel element consisting of a graphite body, hexagonal in transverse cross-section approximately 14.2" across the flats and 31.2" high. Disposed in columns within the fuel element body there is a maximum 1.41 kg U-235 plus U-238 and Th-232. The U-235: U-238: Th-232 atomic ratio is about 1:0.07:8.3. The atomic ratio of carbon to the U-235 is in the range of 1800 to 1.

(2) Maximum quantity of material per package

One fuel element containing not more than 1.41 kg U-235 and weighing not more than 320 pounds.

(c) Fissile Class II and III

(1) Minimum transport index to be shown on label for Class II 1.3

(2) Maximum number of packages per shipment as Class III 100

6. 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: March 31, 1997.

REFERENCE

General Atomic Company application dated February 19, 1982.

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAR 18 1992

NRC FORM 618
(5-85)
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
6357	5	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.

b) Contents

(1) Type and form of material

Uranium metal, alloys or compounds. Uranium may be enriched to any degree in the U-235 isotope.

(2) Maximum quantity of material per package

Contents shall not exceed 100 pounds, and the U-235 content shall not exceed 350 grams.

(c) Fissile Class — II and III

(1) Minimum Transport index to be shown on label for Class II — 2.1

(2) Maximum number of packages per shipment for Class III — 48

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, 1996.

REFERENCES

Babcock & Wilcox application dated February 28, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: APR 16 1991

NRC FORM 618
(6-86)
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
6386	13	USA/6386/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
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 A1G/A4W type. Subsequently, the container has been adapted to ship A1W-3 fuel modules using a strongback, partial A1W-R3 fuel modules using module support assemblies, standard size or partial S8G fuel modules by use of a special frame assembly and cradle clamps, S3G-3 refueling modules using cell support assemblies, rodded or unrodded D1G fuel modules, rodded ASNPP fuel cells and rodded or unrodded D2W fuel cells. The loaded container maximum weight is 12,421 pounds.

(3) Drawings

The packaging is constructed in accordance with Container Research Corporation Drawing Nos. 235R001, Rev. C, 235R004, Rev. C, and 235R005, Rev. 0, and Westinghouse Electric Corporation Drawing Nos. 973D425, Rev.1, 903E693, Rev. 3, Sheet 1, 2 and 3 of 3, and 947J076, Rev. 0.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following types:

(i) A1G and A4W reactor cell without upper mechanism and with control rod, leadscrew and shipping fixture installed on rodded type modules.

(ii) A1W-3 rodded-type module without upper mechanism and with control rod, leadscrew, and control rod holddown device installed.

(iii) A1W-3 unrodded-type module.

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

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

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

(vii) D1G fuel module, rodded.

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

(ix) A1G fuel cluster, fueled end only of full A1G reactor cell, rodded.

(x) ASNPP fuel cell with control rod, and control rod holddown device installed.

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

(xii) D2W corner fuel cells, unrodded.

(xiii) STC fuel cells, unrodded.

(xiv) D2W fuel cell and shear block with control rod inserted in rodded fuel cell.

(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)(x), or 5(b)(1)(xiv).

(ii) Two fuel assemblies as described in 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(ix), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii).

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

(c) Fissile Class III

Maximum number of packages per shipment:

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

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

(3) For the contents described in 5(b)(1)(i), 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) and limited in 5(b)(2)(i), 5(b)(2)(ii), and 5(b)(2)(iii): 4

6. Commingling of packages for Fissile Class III shipment is authorized provided that the sum of the ratios of the number of packages of an individual type to be shipped to the maximum allowable number of packages of that type per shipment does not exceed unity.

7. Expiration date: July 31, 1997.

REFERENCE

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

Supplements: Knolls Atomic Power Laboratory letter AIG 25-159, dated October 2, 1970. Bettis Atomic Power Laboratory letters WAPD- OP(R)RD-444, dated October 9, 1970; WAPD-OP(R)RD-476, dated October 26, 1970; and WAPD-OP(R)RD-488, dated October 30, 1970. Knolls Atomic Power Laboratory letters AIG 25-181, dated April 9. 1971; and AIG 25-191, dated May 11, 1971. Bettis Atomic Power Laboratory letters WAPD-OP(R)C-94, dated May 16, 1972; WAPD-OP(R)C-199, dated December 13, 1972; and WAPD-OP(R)C-229, dated March 6, 1973. Naval Reactors letters G#5078, dated January 26, 1976; G#5776, dated September 8, 1977; G#5905, dated January 23, 1978; G#5923, dated February 22, 1978; G#6095, dated August 17, 1978; G#6208, dated March 8, 1979; G#6373, dated September 4, 1979; 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; and G#92-03560, dated June 15, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

for Ross Chappell

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Dated: JUL 23 1992

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
6400	21	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 Corporation
P.O. Box 355
Pittsburgh, PA 15230

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. EG-60-01D, Sheets 1 and 2, Rev. 0; or (5) Protective Packaging, Inc. Drawing No. 32395, Sheets 1 through 9, Rev. B, as modified by Sandia Laboratories letter dated May 8, 1980; or (6) Lawrence Livermore National Laboratory Drawing Nos. AAA81-108683-00, Rev. 0 and AAA81-110194-00, Rev. 0.

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 "strippable" 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.

(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.

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) 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. 1520E43, 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.

(7) Liquid analytical residues from the dissolution of spent reactor fuel rods, solidified in cement (see table, p. 3 of application*). The cement is contained in 1.5-gal steel can closed with a slip cover lid. The two primary cans are packed in a secondary steel can sealed with a press fit lid (see Figure 2 of application*). The secondary containment package contents are placed within a radiation shield (lid secured with six (6), 1/2"-13UNC bolts with welds in accordance with application*) centered in a DOT Specification 17-C 55-gal steel drum (see Figure 1 of application*). The drums are sealed with styrene-butadiene rubber gasket contained with a standard drum closer. Total weight of the drum will be less than 1,450 lb, and each drum will not exceed a fissile quantity of 12 g and 435 Ci of fission products.

Six (6), 55-gal sealed drum assemblies will be enclosed in a tight-fitting 3/16-in thick corrugated steel box constructed in accordance with Rockwell-Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be fitted with foam to a minimum thickness of 1/2 inch. Two (2) corrugated steel box assemblies may be transported in the packaging.

* U.S. Department of Energy letter dated April 15, 1983.

(8) Uranium 233 oxide and thorium oxide in the form of intact LWBR-type fuel rods with the following limitations:

(i) Rods must be packaged as shown in Figure 4, Application dated July 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.

(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 othe 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 in subject to the following limitations:

(i) Radioactivity not to exceed 10,000 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.

(c) Fissile Class III

Maximum number of packages per shipment One (1)

6. The polyurethane foam must be Instapak 200, or equivalent.

7. The maximum weight of the contents including secondary packaging, dunnage, shoring and bracing must not exceed 30,000 pounds.

8. Sufficient dunnage, shoring and/or bracing must be utilized to minimize secondary impact of the secondary packaging within the cavity under accident conditions.

9. Protrusions from secondary packaging such as lifting eyes, etc., must be positioned such that they will not contact the cavity walls, or shoring must be provided to prevent puncture of the cavity walls by the protrusions under the accident conditions.

10. Contents must be positioned in the cavity such that the center of gravity of the loaded package is substantially the same as the center of gravity of an empty package.

11. The cavity of the overpack must be vented through an absolute filter to equalize pressure between the outside and inside of the overpack.

12. 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: June 30, 1997.

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 supplement dated: April 14, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JUN 10 1992

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
6406	9	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.

5.(b) Contents (Continued)

(vii) S1W-3 Removable Subassembly (RSA) in the Model No. S1W RSA/Metal Box.

(viii) S5W-2 Removable Subassembly (RSA) in the Model No. S5W RSA/Bird Cage.

(ix) S5W-R2/R3 or S5W-2 module in the Model No. S5W New Module container.

(x) A1W-2/R2 cluster or half cluster in the Model No. 658C shipping container.

(xi) S3G-2A/2B fuel module in the Model No. 7481E12 or Model No. 9SK218 shipping container.

(xii) D2W rodded fuel cell or unrodded corner type D2W fuel module in a Model No. 658E1AB 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)

(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) Fissile Class III

Maximum number of packages per shipment:

(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):	1 (one)
(2) For the contents described in 5(b)(1)(iii), 5(b)(1)(v), 5(b)(1)(ix), 5(b)(1)(x) or 5(b)(1)(xviii) and limited in 5(b)(2)(i):	2 (two)
(3) For the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(i):	3 (three)
(4) For the contents described in 5(b)(1)(vii) and limited in 5(b)(2)(i):	4 (four)
(5) For the contents described in 5(b)(1)(xvi), and limited in 5(b)(2)(i):	8 (eight)
(6) For the contents described in 5(b)(1)(i) and 5(b)(1)(ii) and limited in 5(b)(2)(i):	3 (three) of 5(b)(1)(i) plus 1 (one) of 5(b)(1)(ii)

6. Commingling of packages for Fissile Class III shipment is authorized provided that the sum of the ratios of the number of packages of an individual type to be shipped to the maximum allowable number of packages of that type per shipment does not exceed unity.

7. Expiration date: December 31, 1997.

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; and G#92-03698 dated September 11, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Dated: OCT 14 1992

NRC FORM 618
(9-83)
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	5	USA/6441/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 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.

Page 2 - Certificate No. 6441 - Revision No. 5 - Docket No. 71-6441

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

The closure head in a Type A and Type B power unit contains an integral bolting flange. This type of power unit is retained in the container by means of eight shipping bolts which clamp the power unit to the barrel upper flange of the shipping container. The control rods in a Type A or B power unit are restrained in the power unit by means of control rod hold down latch pawls located in the upper control rod drive mechanism. The Type C, D, or E power unit is also retained in the container by means of eight shipping bolts but because the closure heads on these power units do not include a bolting flange, a special shipping ring is used to clamp the closure head and core cartridge assembly to the barrel upper flange of the shipping container. The control rods in a Type C, D, or E power unit are restrained in the power unit by means of rebound and outmotion latches located in the latching portion of the control rod drive mechanisms. The container assembly weighs about 100,000 pounds empty and about 270,000 pounds loaded.

(3) Drawings

The packaging is constructed in accordance with Baldwin-Lima-Hamilton Corporation Drawing Nos. R-126361, Rev. E, and R-126347, Rev. K, and Westinghouse Electric Corporation Drawing Nos. 955F632, Rev. 5, and 972D940, Rev. 5.

(b) Contents

(1) Type and form of material

Unirradiated enriched uranium as contained in Naval Reactors Type A, B, C, D, or E power units consisting of core barrel, unirradiated fuel assemblies, closure head, mechanisms and associated hardware, with all design control rods and mechanisms installed.

(2) Maximum quantity of material per package

One power unit as described in 5(b)(1).

(c) Fissile Class III

Maximum number of packages per shipment one (1)

6. Expiration date: December 31, 1997.

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; and Naval Reactors letter NR:RR:ESSNIDER G#92-03731, dated October 7, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: DEC 14 1992

NRC FORM 618
(8-89)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6553	6	USA/6553/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*)

U.S. Department of Energy
EH-33.2
Washington, DC 20545

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report on the "Paducah Tiger" Protective Overpack for 10-Ton Cylinders of Uranium Hexafluoride, Report No. KY-665, June 16, 1975, and Supplement 1, dated May 20, 1977, as supplemented.

c. DOCKET NUMBER 71-6553

4. CONDITIONS

This certificate 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 a 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. A centrally located 3/16-inch steel shell, 60 inches in diameter x 128 inches long is separated from the outer shell by fire retardant polyurethane foam. The cylinder is held in the overpack by rubber shock isolators. Four mild steel brackets are provided on the body for lifting. The four ISO corner fittings on each of the lid and body sections may be used for lifting. Four, 2-inch bolts are used in conjunction with the ISO corner fittings for tie-down. The package gross weight is 37,500 pounds.

(3) Drawings

The Paducah Tiger overpack is constructed in accordance with Protective Packaging, Inc. Drawing Nos. 32301, Rev. B and 32302, Rev. B; Union Carbide Corporation Drawing Nos. EM-1209-A, Rev. 9; EM-1209-B, Rev. 10; EM-1209-C, Rev. 7; EM-1209-D, Rev. 8; EM-1209-E, Rev. 4; EM-1209-F, Rev. 8; EM-1209-G, Rev. 6; EM-1209-H, Rev. 3; and EM-1209-J, Rev. 1; and Martin Marietta Energy Systems, Inc., Drawing No. M5E17418A, Rev. 5.

5. (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 619 pounds (280 kg).

(c) Fissile Class I

6. The Model No. 48X cylinder must be fabricated, inspected, tested, maintained, assembled, and used in accordance with American National Standards Institute N14.1-1990. The cylinders must be fabricated in accordance with Section VIII, Division I, of the ASME American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code and should be ASME Code stamped.

7. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be maintained, operated and prepared for shipment in accordance with Paducah Gaseous Diffusion Plant Standard Operating Procedure CH-423, Rev. 0, dated June 10, 1992.

8. Use of the 48X cylinders 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: November 30, 1998.

REFERENCES

Safety Analysis Report on the "Paducah Tiger" Protective Overpack for 10-Ton Cylinders of Uranium Hexafluoride, Union Carbide Corporation Report No. KY-665, June 16, 1975, and Supplement 1, May 20, 1977.

Supplements dated: June 10 and 14, 1988; July 1, 1993; and August 15, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: 04/21/95

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
6568	8	USA/6568/A	1	3

2. PREAMBLE

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

Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Tennessee Valley Authority application dated August 16, 1976, as supplemented.

c. DOCKET NUMBER 71-6568

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: LL-60-150

(2) Description

The cask is cylindrical in shape 93 inches long and 82.5 inches in diameter. Lead shielding, 3-1/2 inches thick, is encased within the inner and outer steel shells that are welded to a laminated steel base plate assembly. The cover is a steel plate assembly secured to the top flange by 36 steel bolts. Encircling the top of the cask is a partial length steel shell of 1/2-inch thickness. Silicone O-rings provide seals at the top cover and at all plugs. The inner container is right circular steel cylinder with a capacity of 150 cu ft. The total weight, when loaded, is approximately 73,000 pounds.

(3) Drawings

The packaging is constructed in accordance with the following ATCOR Inc. Drawing Nos.: 0568-B-0005, Rev. H; 0568-C-0008, Rev. E; 05268-B-0010, Rev. E; 0568-B-0016, Rev. D; 0568-B-0018, Rev. A; 0568-B-0025; 0568-R-0001, Rev. J.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid, or solidified waste, meeting the requirements for low specific activity material in sealed containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the package contents and secondary containers not exceeding 12,500 pounds.

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/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have 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 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. In addition to the requirements of Subpart G of 10 CFR Part 71:

(i) Each package must be maintained in accordance with Reactor Cleanup Cask Maintenance Program in the supplement dated February 20, 1991.

(ii) The package must be prepared for shipment and operated in accordance with the Reactor Cleanup Cask Operating Procedure in the supplement dated February 20, 1991.

Page 3 - Certificate No. 6568 - Revision No. 8 - Docket No. 71-6568

8. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

9. Fabrication of additional packagings is not authorized.

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

11. Expiration date: March 31, 1996.

REFERENCES

Tennessee Valley Authority application dated August 16, 1976.

Supplements dated: October 8, 1976; October 5, 1979; October 23, 1980; and February 20, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: APR 10 1991

NRC FORM 618
(9-88)
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	22	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)*

Scientific Ecology Group, Inc.
1560 Bear Creek Rd.
Oak Ridge, TN 37831-2530

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) Drawing

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 the operating procedures in the supplement dated March 13, 1991.

(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.

12. Model No. 3-82B shipping containers constructed in accordance with Scientific Ecology Group, Inc. Drawing No. STD-02-075 Sheets 1 through 3 Rev. 6 are not authorized after May 31, 1991.

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

14. Expiration date: April 30, 1996.

REFERENCES

Scientific Ecology Group Incorporated application dated December 27, 1990.

Supplement dated: March 13, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: APR 11 1991

NRC FORM 618
(8-89)
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	22	USA/6581/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 Nuclear 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. Minimum 3/8" thick wall, 6" x 8" x 8-1/2" long steel separators are bolted between fuel bundles. Outer container is approximately 43" diameter by 216" long. The maximum weight of the package, including contents, is 7,400 pounds.

(3) Drawings

The packaging is constructed and assembled in accordance with:

Jersey Nuclear Company Drawing No.:

JN-200002, Rev. -,

and Exxon Nuclear Company, Inc., Drawing Nos.:

XN-NF-303,359, Rev. 2
XN-NF-303,360, Rev. 1
XN-NF-303,898, Rev. 1
XN-300,607, Rev. 1
XN-300,609, Rev. 1
XN-NF-303,364, Rev. 1

and Siemens Nuclear Power Corporation/Advanced Nuclear Fuels Corporation Drawing No.:

EMF-303,897, Rev. 2

(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 w/o in the U-235 isotope. Cladding must have a minimum wall thickness of 0.02 inch and a minimum nominal pellet-clad radial gap of 0.003 inch. The maximum length of the active fuel region is 196 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 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.

(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), and 5(b)(1)(iii):

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) Fissile Class I

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, and 2.5 of the application.

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

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

11. 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.

    (b) Each packaging shall be maintained in accordance with the procedures in Chapter 3.0 of the application.

    (c) Each packaging shall meet the acceptance tests in Chapter 4.0 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: May 31, 1999.

REFERENCES

Advanced Nuclear Fuels Corporation application dated October 15, 1990.

Siemens Nuclear Power Corporation supplements dated September 18, 1991, April 22, 1992, and January 25, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: MAR 15 1994

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
6601	24	USA/6601/A	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 August 23, 1985, as supplemented.

c. DOCKET NUMBER

71-6601

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 8-120A

(2) Description

The packaging is a steel-encased, lead shielded shipping cask which weighs approximately 70,000 pounds when loaded. The cask is 73.5 inches in diameter by 92 inches high, with an effective cavity 62 inches in diameter by 75 inches long. Gamma shielding equivalent to 4.5 inches of lead is provided by lead and steel. The outer shell is fabricated of two, 3/4-inch thick steel plates and the inner shell of 1/2-and 1/4-inch thick plates. The cavity is closed and sealed by thirty-two, 1-3/4-inch bolts and a silicone O-ring within a recessed groove on the flange of the cask. A steel collar encircles the outer shell in the lid area. Shackles are used for lifting the packaging and the lid. Tie-down is accomplished through a steel structure which is not attached to the package. The lid provides several threaded and sealed access plugs and the base has a drain line.

(3) Drawings

The package is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing No. 29008-1, Sheet 1 Rev. 2, and Drawing No. 29008-1, Sheet 2, Rev. 2.

5. (b) Contents

(1) Type and form of material

(i) Process solids, either dewatered, solid, or solidified in a secondary container, meeting the requirements for low specific activity material; or

(ii) Solid reactor components in secondary containers, as required, that meet the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material, not to exceed 2,000 times a Type A quantity, 40 thermal watts, and 20,000 pounds including weight of the contents, secondary container(s) and shoring. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

6. Except for close fitting contents, wood shoring must be placed between the secondary container(s) (or activated components) and the cask cavity to prevent movement during normal conditions of transport.

7. Prior to each shipment, the lid gasket must be inspected. The gasket must be replaced if inspection shows any defect or every 12 months which ever occurs first.

8. Prior to each shipment, a determination must be made that closure seal replacement is current with the seal replacement schedule in Section 8.2.2 of the application.

9. The packaging must be leak tested once every 12 months in accordance with Section 8.1.3 of the application.

10. The drain line and access plugs must be appropriately plugged and sealed prior to transport.

11. (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% 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%.

CONDITIONS *(continued)*

11. (continued)

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

(b) For any package 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 must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

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

(i) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application; and

(ii) The package must be operated and prepared for shipment in accordance with the Operating Procedures of Chapter 7 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: February 28, 1996.

REFERENCES

Chem-Nuclear Systems, Inc., application dated August 23, 1985.

Supplements dated: December 30, 1985, January 16, 1991, October 29, 1991 and January 7, 1992.

Northeast Nuclear Energy Company supplement dated: February 9, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: FEB 27 1992

NRC FORM 618
(9-86)
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
6613	6	USA/6613/B(U)	1	2

PREAMBLE

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

. (a) Packaging (Continued)

(3) Drawing

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.

(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.

. 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: March 31, 1998.

REFERENCES

Amersham Corporation application dated November 27, 1991.

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: APR 1 1993

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
6642	5	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: October 31, 1996.

REFERENCES

Safety Analysis Report - Packages SRL 4.5-Ton Californium Shipping Cask, DPSPU 71-124-6, December 1974, Revision 1, March 1976.

Supplements dated: September 18, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: OCT 09 1991

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
6697	9	USA/6697/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
EH-33
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Electric Company Application
dated November 29, 1979, as supplemented.

c. DOCKET NUMBER

71-6697

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: GE-8500

(2) Description

The packaging is a steel, uranium shielded shipping cask surrounded by a laminated plywood protective jacket.

The shielded cask is an upright circular cylinder, consisting of an inner shell, 2-7/8 inches ID x 6-1/8 inches high, made of 1/8-inch thick stainless steel which is surrounded by 1-13/16 inches of depleted uranium and enclosed in a 7-inch OD x 10-1/2-inch high x 1/8-inch thick stainless steel outer shell.

Closure is by means of six, 3/8-inch diameter bolts and a 1/8-inch thick Neoprene rubber gasket between body and lid. The shielded cask is positioned in a two-piece protective jacket of solid plywood laminations which is bolted to a rectangular pallet made of aluminum. The protective jacket is 15-1/4 inches OD x 20-1/2 inches high and together with the pallet, weighs 80 pounds. The cavity of the shielded cask contains a leak tight, steel inner container. The gross weight of the loaded package is approximately 285 pounds.

(3) Drawings

The package is constructed in accordance with the following General Electric Company Drawing Nos.: 277E696, Rev. 6; 277E712, Rev. 6; 174F482, Rev. 5; 289E795, Rev. 3; 195F169, Rev. 2; 289E796, Rev. 5; 161F443, Rev. 5; or 135C5982, Rev. 4; or 106D3830, Rev. 8 with 153C4513, Rev. 1.

Page 2 - Certificate No. 6697 - Revision No. 9 - Docket No. 71-6697

5. (b) Contents

(1) Type and form of material

Byproduct material as a liquid or solid within an inner container shown in General Electric Drawing Nos. 161F443, Rev. 5; or 135C5982, Rev. 4; or 106D3830, Rev. 8, used with the liner shown in 153C4613, Rev. 1.

(2) Maximum quantity of material per package

Greater than a Type A quantity of byproduct material as a solid with the decay heat load not exceeding 50 watts.

Byproduct material as a liquid is limited to 100 ci of Mo-Tc.

6. Liquids must be further packaged in a leak tight polyethylene bottle within the inner container. Each polyethylene bottle must be sealed and tested in accordance with Attachment D of General Electric's letter dated November 29, 1979, or Appendix A in the September 3, 1991, supplement.

7. Prior to each shipment, the package lid Neoprene gasket must be inspected. The gasket must be replaced with a new Neoprene gasket if inspection shows any defect or every twelve (12) months, whichever occurs first. In each shipment, a new Viton O-ring must be used to seal the inner container.

8. The inner container must be pretested to ensure leak tightness prior to each use in accordance with Attachment D of General Electric's letter dated November 29, 1979, or Appendix B in the September 3, 1991, supplement.

9. The radiation dose rate must not exceed 1,000 millirem per hour, at a distance of 3 feet from the surface of the depleted uranium cask, when the wooden protective jacket is not in place.

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

(a) Each package must be maintained in accordance with the Maintenance Program in the October 4, 1990, and September 3, 1991, supplements; and

(b) Each package shall be prepared for shipment and operated in accordance with the Operating Procedures in the October 4, 1990, and September 3, 1991, supplements.

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, 1996.

Page 3 - Certificate No. 6697 - Revision No. 9 - Docket No. 71-6697

REFERENCES

General Electric Company application dated November 29, 1979.

General Electric letter dated February 21, 1985.

DOE supplements dated: February 27, 1985; January 31 and October 4, 1990; and September 3, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: SEP 19 1991

NRC FORM 618
(5-85)
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
6717	9	USA\6717\B(U)	1	4

PREAMBLE

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

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: September 30, 1998.

REFERENCES

Amersham Corporation application dated October 10, 1990.

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUN 0 8 1994

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
6722	11	USA/6722/A	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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)
Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Tennessee Valley Authority application dated July 9, 1975, as supplemented.

c. DOCKET NUMBER 71-6722

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

5.

(a) Packaging

(1) Model No.: BS-33-180

(2) Description

The shipping cask is a cylindrical steel weldment with overall dimensions of 84 inches in diameter and 97-1/4 inches in length. The effective cavity is 76-1/2 inches in diameter by 79-1/4 inches long. The outer shell is fabricated of concentric layers consisting of three, one-inch thick and 1/2-inch thick carbon steel plates. The inner half-inch thick shell is separated from the one-inch thick shells by a 1/4-inch thick asbestos sheet. The flange is three inches thick, with 36 tapped holes and a groove to accommodate a silicone O-ring. The top cover is secured to the flange ring by 36, ASTM-A-320, Grade L7 1-1/2-inch bolts. A 10-inch deep steel impact limiter is mounted to the top cover to act as a shock absorber. The cask is mounted to a tie-down frame by sixteen, 1-1/4-inch high strength steel bolts. Other cask features include a drain line, access port to the inner container(s) and a reinforcing steel shell to protect the cask seal. Threaded access plugs are installed on the top of the liner. A bottom side drain is also provided. Maximum gross weight is approximately 51,100 pounds.

(3) Drawing

The packaging is constructed in accordance with the following ATCOR Inc. Drawing Nos.: 0568-C-0024, Rev. F; 0568-D-0022, Rev. F; 0568-D-0023, Rev. D; 0568-C-0026, Rev. B.

(b) Contents

(1) Type and form of material

Solids or solidified waste, meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents (including containers and shoring) limited to 18,000 pounds and 20 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 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. 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 March 21, 1991.

(b) The package shall be maintained in accordance with the maintenance program in the supplement dated January 17, 1991.

8. Dunnage must be provided in the shipping cask cavity sufficient to prevent significant movement of the inner container(s) relative to the outer packaging under normal conditions of transport.

9. Prior to each shipment all threaded pipe plugs in the cask are sealed using an appropriate sealant.

10. The space between the inner container(s) and cask cavity must be dry prior to delivery to a carrier for transport.

11. Prior to each shipment, the package lid seal must be inspected. The seal must be replaced with a new silicone O-ring if inspection shows any defects or every twelve (12) months, whichever occurs first. After seal replacement the package must be leak tested to 1×10^{-3} std cm^3/sec.

12. All eight (8) lifting shackles must be shrouded by the appropriate covers prior to transport to prevent its use as tie-down devices.

13. Fabrication of additional packagings is not authorized.

14. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

16. Expiration date: April 30, 1996.

REFERENCES

Tennessee Valley Authority application dated July 9, 1975.

Supplements dated: February 10, 1977, September 17, 1990; January 17 and March 21, 1991, and September 4, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 10 1992

NRC FORM 618
(5-85)
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
6786	5	USA/6786/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 Navy
Naval Support Force Antarctia
FPO San Francisco, CA 96601

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Aerojet Application dated February 18, 1971, as supplemented.

c. DOCKET NUMBER 71-6786

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: URIPS-8A and URIPS-8B

(2) Description

The packages, thermoelectric generators, are 28.5 inches in overall height, with an outer diameter of 19.14 inches, and total weight of approx. 1,600 pounds. The components include a depleted uranium shield (470 lbs.), a steel housing, cover bolts (recessed and caulked over), an electrical adaptor, cooling fin system, and cylindrical fin guard, stiffened by eight ribs on the inside surface. The housings are equipped with lifting and tie down devices. The Model No. URIPS-8B differs from Model No. URIPS-8A in the electric converter system. The thermoelectric generator may be secured in a shipping frame identified in Drawing No. 1138459, 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 in the supplement dated June 18, 1991.

(b) The package must be maintained in accordance with the Maintenance procedures listed in the supplement dated June 18, 1991.

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, 1998.

CONDITIONS *(continued)*

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 455/1U59999U8 dated June 18, 1991.

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: APR 07 1993

NRC FORM 618
(9-83)
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
9001	30	USA/9001/B( )F	1	6

PREAMBLE

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

VECTRA Technologies, Inc.
6203 San Ignacio Ave. Suite 100
San Jose, CA 95119

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, 64 inches in diameter and a maximum of 210 inches long with maximum cavity dimensions of 37-1/2 inches in diameter by 180-1/4 inches long. Shielding is provided by 4 inches of depleted uranium, 2-1/8 inches of stainless steel and a minimum of 4-1/2 inches (550 gallons) of a water ethylene glycol mixture.

Two closure heads are provided for the shipment of BWR and PWR fuel assemblies. The heads are 304 stainless steel forgings and end plates which encase the 3-inch thick depleted uranium shielding. Either closure head may be used for packaging solid irradiated hardware.

The closure heads are secured to the cask body by means of 32, 1-3/4 inch studs and nuts. The cask is sealed with a metallic ring gasket.

The cavity is penetrated by a vent line at the top and a drain line at the bottom. These lines are sealed by bellows 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.

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 stain-less 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 20[illegible] psig.

The cask has three types of fuel baskets which can be interchanged to accommodate various fuels. The PWR basket holds seven assemblies, the unchannelled BWR basket holds eighteen assemblies, and the channelled BWR basket holds seventeen assemblies. The channelled and unchannelled 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-[illegible]-foot long by [illegible]-foot wide structural steel skid. The skid may also have [illegible] an auxiliary cooling system, consisting of two diesel engines driving two blowers which discharge cooling air to the corrugated surface of the cask via common ducting. Neither installation nor operation of any part of this auxiliary cooling system is a requirement of this package approval.

The entire cask and cooling system is covered by a retractable aluminum enclosure. Access to the enclosure is via locked panels in the side and a locked door in one end. Although the Model No. IF-300 cask can be transported for short distances on the highway, its principal mode of transportation is by railroad.

The gross weight of the cask is approximately 140,000 pounds. The skid and other external components weigh approximately 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; 420-11-3006, Sheet 1, Rev 1.

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 not be shipped unless dummy fuel pins are used to displace an amount of water equal to that displaced by the original pins. The specific power of each fuel assembly must not exceed 40 kW/kgU and the burnup of each fuel assembly must not exceed 35,000 MWD/MTU. The minimum cooling time of each assembly must be no less than 120 days. Prior to irradiation, the BWR and PWR fuel assemblies must have the following dimensions and specifications:

Group 1 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, wt%	4.0	4.0
Maximum bundle cross section, in	8.75	5.75
Fuel pin array	14x14/15x15	7x7
Fuel diameter, in	0.380-0.460	0.500-0.600
Fuel pin pitch range, in	0.502-0.582	0.647-0.809
Maximum active fuel length, in	145	146

5. (b) Contents (continued)

Group II fuel assemblies

	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, w/o	4.0	4.0
Maximum bundle cross section, in.	8.75	5.75
Fuel pin array	16x16/17x17	8x8
Fuel diameter, in.	0.376-0.400	0.475-0.505
Fuel pin pitch range, in.	0.506-0.507	0.630-0.645
Maximum active fuel length, in.	150	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 with 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 channelled BWR assemblies, or eighteen unchannelled 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, Sheet 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) Fissile Class I

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.

10. Group I fuel assemblies which are 15x15 type PWR fuel assemblies and have a maximum initial U content of 467 kilograms per assembly and a minimum cool 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 unchannelled 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, 2000.

REFERENCES

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

VECTRA Technologies, Inc. supplements dated April 27, and August 28, 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

SEP 2 1 1995

Date:_____

NRC FORM 618
(9-83)
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
9006	11	USA/9006/B(U)	1	2

PREAMBLE

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

Tech/Ops Inc. application
dated March 31, 1986, as supplemented.

c. DOCKET NUMBER 71-9006

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: AI-500 SU

(2) Description

A radiographic source changer consisting of a welded 10-gauge stainless steel box, approximately 5" wide x 5" high x 11" long. The source changer has a positive closure hinged flat plate cover and a depleted uranium shield. Two 1 tantalum tubes are positioned in the center of the depleted uranium and house the source capsules and the source cable assemblies. The two openings are closed by locking assemblies and threaded holddown caps. The gross weight is approximately 65 pounds.

(3) Drawings

The packaging is constructed in accordance with Tech/Ops, Inc. Drawing Nos. AI500SU90, Sheets 1 through 7, Rev. C or AI500SU90, Sheets 1 through 3, Rev. -; AI500SU91, Sheets 1 and 2; AI500SU92; and optional Drawing No. AI500SU93, Rev. A.

The threaded holddown caps used to secure the source cable assemblies within the titanium tubing shall be fabricated in accordance with Tech/Ops, Inc. Drawing No. SK2334-2, Rev. D.

(b) Contents

(1) Type and form of material

Iridium 192 as a sealed source which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The source shall be positioned within the titanium tubing by a source cable assembly which meets the parameters shown in Tech/Ops, Inc. Drawing No. 42402-1, Sheets 1 through 3, Rev. K.

7. The name plate shall be fabricated of materials capable of resisting the fire tests 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 Chapter 7 of the application, as supplemented.

   (b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 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, 2000.

REFERENCES

Tech/Ops, Inc. application dated March 31, 1986.

Amersham Corporation supplements dated April 28, June 28, June 22 and August 13, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: SEP 0 3 1995

NRC FORM 618
(5-89)
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
9007	7	USA/9007/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

Tech/Ops, Inc. application dated October 7, 1985, as supplemented.

c. DOCKET NUMBER 71-9007

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: AI 520

(2) Description

A uranium shielded radiographic device consisting of an ovated 5" OD x 1/8" thick steel tube welded to two, 10-gauge end plates. An opening on each plate gives access to the "S"-shaped titanium tubing which houses the source capsule, source cable assembly, and the end plug. The two end openings are closed with threaded end caps. A lock mechanism is provided at the source cable attachment. Gross weight of the package is approximately 40 pounds.

(3) Drawings

The packaging is constructed in accordance with Tech/Ops, Inc. Drawing Nos. AI 52090, Sheets 1 through 4 and AI 52091, Sheets 1 and 2; and Automation Industries, Inc. Drawing No. 100-520-014, Rev. A.

CONDITIONS *(continued)*

Page 2 - Certificate No. 9007 - Revision No. 7 - Docket No. 71-9007

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package.

120 curies

6. The source shall be positioned within the titanium tubing by a source cable assembly which meets the parameters shown in Tech/Ops, Inc. Drawing Nos. 42402-1, Rev. L and 42402-4, Rev. B.

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 Section 7 of the application.

(b) Each package must be tested and maintained in accordance with the acceptance tests and maintenance program in Section 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: December 31, 1995.

REFERENCES

Tech/Ops, Inc. application dated October 7, 1985.

Supplement dated: November 26, 1985; October 19, and December 21, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 17 1991

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9009	13	USA/9009/B( )F	1	4

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 780
Wilmington, NC 28402

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 rat ring to receive the containment vessel, and fire resistant phenolic foam, formed in place to an average finished density of at least 8 pounds per cubic foot for the main body and 10 pounds per cubic foot for the cap. Gas relief holes shall be provided in the outer steel drum.

The containment vessel is a 304L stainless steel 5-inch Schedule 40 pipe, approximately 53-1/2 inches long, with a 304L stainless steel 1/2-inch thick welded bottom plate and a 304L stainless steel 300 pound 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.

(2) Maximum quantity of material per package

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

Not to exceed 3.775 kilograms fissile material, 21 watts decay heat, and 10 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 2.45 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.

(c) Fissile Class I

6. The solution contents of the package shall be contained within a bottle having one of the following specifications:

   (i) Slit vent polyethylene bottle per Drawing No. CAPE-1170-37,

   (ii) Duo-vent polyethylene bottle per Nuclear Fuel Services, Inc., Specification U-1 and Drawing No. 5B-U-740, or per General Electric Company Drawing No. 112D3013, Rev. 0, or

   (iii) Stainless steel bottle as shown on General Electric Company Drawing Nos. FRO-140 and FRO-140A.

7. The polyethylene bottles may be packaged within the metal inner container described by Chester-Jensen Company, Inc., Drawing Nos. 1092M-1, 1093M-1, 1095M-1 and 1096M-1, Issue 1, dated April 26, 1971.

8. The packaging for the polyethylene bottles shall include a flexible restraining device (such as recommended in ARH-1819 "Vibration Testing of L-3 and L-10 Shipping Containers") placed between the cap assembly of the polyethylene bottle and the closure flange of the pressure vessel to assure that the polyethylene bottle will vibrate at the same frequency as the pressure vessel during transport.

9. Dry compounds and mixtures which shall be packaged within sealed metal cans or DOT Specification 2R containers and placed within an inner container constructed and leak tested as specified on General Electric Illustration AFL 1105. Following the gas leak testing specified on the Illustration, all inner container welds shall be tested using a liquid penetrant method in accordance with Article 6, Section V, ASME Code. Alternatively, the inner container shown in the Illustration may be constructed of 300 series stainless steel pipe with an outside diameter of 4.500 ± 0.031 inches with a wall thickness ranging between 0.095 and 0.140 inch.

10. Appropriate steps shall be taken to assure that from the time of sealing to the time of delivery to the consignee, the pressure in the containment vessel will not exceed 40 psig.

11. 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.

12. In addition to the requirements of Subpart G of 10 CFR 71, a test shall be performed on each containment vessel and associated 1/4-inch stainless steel valve (without its associated pipe cap) initially and once each year at 300 psig and the leak detection performed by a method capable of detecting a leak greater than 10^{-6} atm cc/sec at standard temperature and pressure. Any chamber that fails to pass the test shall be withdrawn from service and repaired to meet the test. For shipment of contents of not more than a Type A quantity of radioactive material, this test shall not be required.

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13. The fire resistant phenolic foam shall be in accordance with AEC Materials and Equipment Specification SP-9 or as modified by ORGDP Reports K/TL-729 and K/P-6567S.

14. 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.

15. 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.

16. 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.

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

18. Expiration date: June 30, 1999.

REFERENCES

General Electric Company application dated January [illegible], 1984.

Supplements dated: April 26 and May 16, 1984 and February 8 and June 7, 1994.

Westinghouse Electric Corporation supplement dated: May 15, 1[illegible].

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUN 29 1994

NRC FORM 618
(2-89)
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
9010	35	USA/9010/B( )F	1	12

2. PREAMBLE

a. This certificate is issued to certify that the packaging 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 Assurance Corporation
6251 Crooked Creek Road
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation application dated November 1, 1990, as supplemented.

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.

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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, 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

5. (a) Packaging (continued)

(3) Drawings (Continued)

Configuration (A)

70516F, Sheet 1, Rev. 8, Spent Fuel Cask General Assembly
70562F, Sheet 1, Rev. 10, Inner Container
70562F, Sheet 2, Rev. 6, Inner Container
70562F, Sheet 3, Rev. 0, Inner Container*
70562F, Sheet 4, Rev. 0, Inner Container*

Configuration (B)

70888F, Sheet 1, Rev. 3, Spent Fuel Cask General Assembly
70886F, Sheet 1, Rev. 2, Basket Concept
70884F, Sheet 1, Rev. 2, Inner Closure Head

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, Assy of*

Configuration (D)

70888F, Sheet 1, Rev. 3, Spent Fuel Cask General Assembly
347-291-F12, Rev. 2, Liner - 3 Element, NLI-1/2 Cask, Fuel Movement Project*

*Nuclear Assurance Corporation drawings.

5. (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 UO2 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

. (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)

5. (b) (1) (ii) (continued)

	Fermi-1	EBR-II Blanket
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

5. (b) (1) (Continued)

(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
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).

5. (b) (1) (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 6061 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. 10 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. 10.

(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: up to 25 PWR fuel rods or up to 25 BWR fuel rods per cask, in Configuration (A) or (B). Up to 2 of the 25 PWR rods may have a maximum burnup of 65,000 MWD/MTU. 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.

(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. 10 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 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) Fissile Class III

Maximum number of packages per shipment One

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.

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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 accordancce with the maintenance program in Section XVI of the application, as supplemented.

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

21. Expiration date: March 31, 1996.

REFERENCES

Nuclear Assurance Corporation application dated November 1, 1990.

Supplements dated: March 7 and 18, August 21, October 2 and 23, 1991; and April 14, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JUN 16 1992

NRC FORM 618
(6-85)
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
9011	5	USA/9011/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:

Picker Corporation application dated September 25, 1973.

c. DOCKET NUMBER 71-9011

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: E-MEH-00-00004

(2) Description

An overpack that provides impact and thermal protection for a teletherapy head assembly. The cubical overpack consists of laminated 2 x 4 hardwood maple panels bolted together and covered with 16 gage steel panels. Reinforcing steel straps and angles are welded together and spaced to limit the openings between them to less than 6 inches. Skid runners are provided to facilitate fork lift usage. Dimensions of the overpack are 36" x 42" x 40.5" with a maximum gross weight of 4,000 pounds.

(3) Drawings

The packaging is constructed in accordance with the following drawings: Advanced Medical Systems, Inc. Drawing No. D-MEH-00-00004, Sheets 2 and 3 through 10, Rev. F.; Advanced Medical Systems, Inc., Drawing No. C-200004; and Picker Corporation teletherapy Head Drawing Nos. E-182545A, Rev. F; and E-182972A, Rev. I.

CONDITIONS *(continued)*

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5. (b) Contents

(1) Type and form of material

Cobalt 60 sealed sources that meet the requirements of special form radioactive material. The sources are to be packaged in a secondary inner container (teletherapy head) as described in Item 5(a)(3).

(2) Maximum quantity of material per package

13,680 curies, with a radioactive decay heat load not to exceed 200 watts.

6. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be maintained, operated and prepared for shipment in accordance with the operating procedures and maintenance program in supplement dated June 26, 1991.

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: August 31, 1996.

REFERENCE

Picker Corporation application dated September 25, 1973.

Supplements dated: April 25, 1986; and May 16 and June 26, 1991.

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: AUG 0 8 1991

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
9015	17	USA/9015/B( )	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)

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 Nos.: TN-8 and TN-8L

(2) Description

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 Annex A, B, and C to Chapter II of the Application.

The lid for Configuration X is constructed in accordance with Transnuclear Drawings 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.

CONDITIONS *(continued)*

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) Fissile Class III

Maximum number of packages per shipment One (1)

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.

CONDITIONS *(continued)*

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. Expiration date: May 31, 1996.

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REFERENCES

Transnuclear, Inc. application dated March 25, 1991

Supplements dated: April 22, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAY 17 1991

NRC FORM 618
(9-88)
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	9	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

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 cooper 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.

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5. (b) Contents

(1) Type and form of material

(i) Irradiated BWR uranium oxide fuel assemblies of the following specifications:

Fuel form	Clad UO_2 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) Fissile Class III

Maximum number of packages per shipment One (1)

6. The cask cavity must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity by the methods described in Annex I to Chapter VIII of the application. 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.

CONDITIONS *(continued)*

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: May 31, 1996.

REFERENCES

Transnuclear, Inc. application dated March 25, 1991

Supplements dated: April 22, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAY 9 1991

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
9019	20	USA/9019/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)*

General Electric Company
P.O. Box 780
Wilmington, NC 28401

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated September 14, 1993, as supplemented.

c. DOCKET NUMBER 71-9019

4. CONDITIONS

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

5(a) Packaging

(1) Model No.: BU-7

(2) Description

The packaging consists of up to two 5-gallon or up to three 3-gallon, 11.25-inch-ID, minimum 24-gauge steel pails contained in a 13.75- to 14.05-inch diameter by nominal 27-inch-long inner container. The inner container is constructed of 18-gauge minimum or 14 gauge maximum steel, with bolted and gasketed (1/8-inch-thick silicone rubber) top flange closure. The inner container is centered and supported in a 22.5-inch-ID, 18-gauge steel, 55-gallon capacity steel drum by solid insulating material composed of fire-retardant phenolic foam (7-9 pounds per cubic foot). Drum closure is provided by a 16-gauge drum cover and a 12-gauge closure ring with drop forged lugs drilled and threaded for a 5/8-inch-diameter bolt and nut. A boral liner located between the inner container and steel pails is required for the contents as specified. The maximum weight of the package, including contents, not to exceed 370 pounds.

(3) Drawing

The container is constructed in accordance with General Electric Company Drawing No. 112D1592, Rev. 12.

5. (b) Contents

(1) Type and form of material

(i) Uranium oxide powder enriched to not more than 5.0 w/o in the U-235 isotope. The maximum H/U atomic ratio shall not exceed 1.6. Exclusive of the boral liner, the mass of moderating materials within the inner container when added to the total mass of moderator within the fuel shall not exceed 5.2% of the weight of the uranium oxide.

(ii) Uranium oxide as pellets or a mixture of powder and pellets enriched to not more than 4.10 w/o in the U-235 isotope. The maximum H/U atomic ratio shall not exceed 0.45. Exclusive of the boral liner, the mass of moderating materials within the inner container when added to the total mass of moderator within the fuel shall not exceed 3.7% of the weight of the uranium oxide.

(iii) Uranium-bearing materials in the form of solids, or solidified or dewatered materials. Uranium may be enriched to not more than 5.0 w/o in the U-235 isotope. Uranium-bearing materials may include oxides, carbides, silicates, or other compounds of uranium. The uranium compound density shall not exceed 10.96 g/cm^3. Compounds of uranium may be mixed with other non-fissile materials. Any degree of moderation may be present.

(2) Maximum quantity of material per package

Weight of contents, boral liner and steel pail shall not exceed 209 pounds per package.

(i) For the contents described in 5(b)(1)(i), the maximum contents per package shall be limited in accordance with the following table:

Maximum U-235 Enrichment w/o	Maximum UO_2 Per Package Without boral liner kgs	with boral liner kgs
2.85	46.0	70.0
3.06	42.0	65.0
3.50	33.0	50.0
4.10	27.0	40.0
4.31	25.0	38.0
4.60	23.0	35.0
4.85	21.0	31.0
5.00	20.0	30.0

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

(ii) For the contents described in 5(b)(1)(ii), the maximum contents per package, with the boral liner inserted inside the inner container, shall be limited in accordance with the following table:

Maximum U-235 Enrichment, w/o	Maximum UO_2 Per Package, with boral liner, kgs
3.06	50.0
4.10	30.0

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

Maximum 17.63 kg uranium per package with the boral liner.

(c) Fissile Class I

6. Powder or pellets may contain any quantity of gadolinium oxide, provided the total mass of uranium oxide plus gadolinium oxide does not exceed the uranium oxide mass limits in 5(b)(2).

7. For contents described in 5(b)(1)(ii), ammonium oxalate and/or ammonium bicarbonate additives (or other additives in which the H/U ratio is greater than 1.0 and the total C_xH_y density in the additive does not exceed 0.72 grams/cm^3) are permitted in the UO_2 powder to the extent that the H/U ratio does not exceed 1.27.

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 section 5.1 of the application.

(b) The package must meet the acceptance tests and maintenance program of sections 5.2, 5.3, and 5.4 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, 1998.

REFERENCES

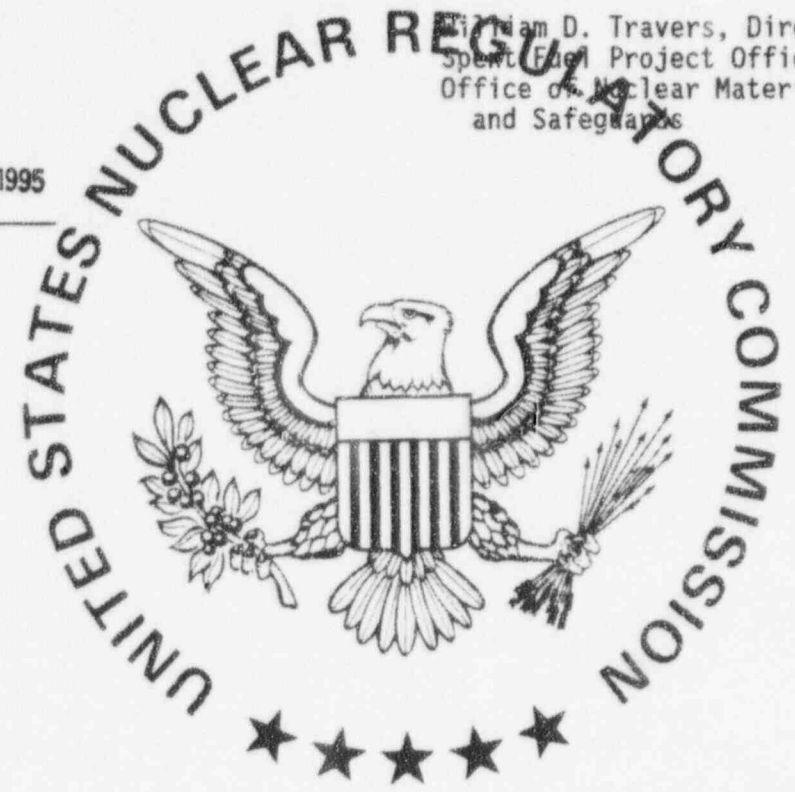
General Electric Company application dated September 14, 1993.

Supplements dated: September 22, 1993, and August 24, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: SEP 21 1995



NRC FORM 618
(5-85)
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
9023	6	USA/9023/B( )F	1	5

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 Assurance Corporation
6251 Crooked Creek Road
Suite 200
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.

Page 2 - Certificate No. 9023 - Revision No. 6 - Docket No. 71-9023

5. (a) Packaging (continued)

(2) Description (continued)

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.

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:

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

Fuel form	PWR Clad UO_2 pellets	BWR Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	475	200
Maximum average initial U-235 enrichment, w/o	3.5	2.8
Maximum initial U-235 content/assembly, kg	16.6	5.6
Maximum bundle cross section, inches	9.00	5.75
Fuel pin array size, number of pins	14x14/15x15 16x16/17x17	7x7/8x8
Maximum active fuel length, inches	144	144
Maximum specific power, kw/kgU	40	27
Maximum average burnup, MWD/MTU	35,500	29,700
Minimum cooling time, days	150	150

The PWR type assemblies may be shipped either with or without control rods.

(2) Maximum quantity of material per package

The maximum decay heat load per package not to exceed 70 kilowatts, and:

Ten 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) Fissile Class — III

Maximum number of packages per shipment for Class III — One(1)

6. The maximum gross weight of the cavity contents must not exceed 34,100 pounds (fuel, spacers, basket, etc.).

7. The containment vessel must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the containment vessel by the methods described in Sectin 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: March 31, 1997.

REFERENCES

Nuclear Assurance Corporation application dated November 18, 1991.

Supplement dated: February 7, 1992.

FOR THE U.S NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAR 11 1992

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9027	9	USA/9027/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 September 16, 1991.

c. DOCKET NUMBER

71-9027

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: 741, 741E, 741A, 741AE, 741B and 741BE

(2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and an "S" tube. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 300 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawings:

(i) Model No. 741 and 741E - Drawing No. 74190, Sheets 1-5, Rev. 6; Drawing No. 66025, Sheets 2 and 3, Rev. A1.

(ii) Model No. 741A, 741B, 741AE, 741BE - Drawing No. 74190, Sheets 1-5, Rev. 6; Drawing No. 85790, Sheets 1 and 2, Rev. B.

Model Nos. with an E suffix have an electrical circuit.

5. (b) Contents

(1) Type and form of material

Cobalt 60 or iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package.

33 curies of cobalt 60; or
240 curies of iridium 192.

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475 °F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.

7. 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 7.0 of the application; and

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

8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR Part 71.

9. Expiration date: November 30, 1995.

REFERENCE

Amersham Corporation application dated September 16, 1991.

Supplements dated: February 20, April 16, August 27, and September 4, 1992 and February 3, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: FEB 03 1995

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
9028	8	USA/9028/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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, Inc. application dated September 16, 1991, as supplemented.

c. DOCKET NUMBER 71-9028

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: 684, 684E, 684A, 684AE, 684B, and 684BE

(2) Description

A steel encased uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and an "S" tube. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging, and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the package is approximately 225 pounds.

(3) Drawings

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

68490, Sheets 1 through 5 of 5, Rev. G, and

<u>for 684 and 684E:</u>
66025, Sheets 2 and 3 of 3, Rev. A

<u>for 684A, 684AE, 684B and 684BE:</u>
85790, Sheets 1 and 2 of 2, Rev. 0.

5. (b) Contents

(1) Type and form of material

Cobalt-60 or iridium-192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

11 curies of cobalt-60; or
240 curies of iridium-192

6. The source shall be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug and source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The name plates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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) Each package must be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.5.1 (dated September 1991) of the application.

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

10. Expiration date: January 31, 1996.

★ ★ ★ ★

REFERENCE

Amersham Corporation, Inc. application dated September 16, 1991.

Supplements dated: February 20, April 16, August 27 and September 4, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles MacDonald

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: SEP 11 1992

NRC FORM 618
(9-88)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9029	11	USA/9029/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 September 16, 1991, as supplemented.

c. DOCKET NUMBER 71-9029

4. CONDITIONS

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

5. (a) Packaging

(1) Model Nos. 676 and 676E, 676A, 676AE, 676B and 676BE

(2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and an "S" tube. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The total weight of the packaging is approximately 545 pounds.

(3) Drawings

The package is constructed in accordance with the following Technical Operations, Inc., Drawing Nos.:

(i) Model No. 676 and 676E - Drawing No. 67690, Sheets 1-5, Rev. H; Drawing No. 66025, Sheets 2 and 3, Rev. A1.

(ii) Model No. 676A, 676AE, 676B and 676BE - Drawing No. 67690, Sheets 1-5, Rev. H; Amersham Corp. Drawing No. 85790, Sheets 1 and 2, Rev. B.

Model Nos. with an E suffix have an electrical circuit.

5. (b) Contents

(1) Type and form of material

Cobalt-60 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

330 Curies.

Page 2 - Certificate No. 9029 - Revision No. 11 - Docket No. 71-9029

6. The source shall be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug 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. 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 7.1.1 (dated September 1991) of the application; and

   (b) The package must meet the Acceptance Tests 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 provisions of 10 CFR 71.12.

10. Expiration date: October 31, 1996.

REFERENCES

Amersham Corporation application dated September 16, 1991.

Supplements dated: February 20, April 16, August 13, September 4 and 11, 1992; September 6, 1994; and February 3, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: FEB 06 1995

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
9030	6	USA/9030/B( )	1	2

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 Support Force, Antarctica
651 Lyon Street
Port Hueneme, CA 93043-4345

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.

(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, 1995.

REFERENCES

Teledyne Energy Systems application dated November 12, 1990.

Teledyne supplement dated: February 1, 1991.

Department of the Navy supplement dated: February 7, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: FEB 17 1994

NRC FORM 618
(8-95)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9032	7	USA/9032/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 September 24, 1993, as supplemented.

c. DOCKET NUMBER 71-9032

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 650

(2) Description

A steel encased, uranium shielded, Iridium-192 source changer. Primary components consist of an outer steel shell, polyurethane potting material, uranium shield, Titanium "U" tube, and source hold down assembly. The source hold down assembly secures the source assembly in position within the crimped "U" tube. Tamper-proof seals and a padlock are provided on the packaging. Total weight of the package is no greater than 90 pounds.

(3) Drawings

The packaging is constructed in accordance with the Technical Operations, Inc. Drawing No. 6500E, Rev. F, Sheets 1, 2, and 3.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475• F fire environment for one-half hour and maintaining its positioning function. The cable of the source assembly must engage the source hold-down assembly. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the crimp of the "U" tube.

7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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, and

   (b) the package shall be prepared for shipment in accordance with the Operating Procedures of Chapter 7 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: October 31, 1999.

REFERENCES

Amersham Corporation application dated September 24, 1993.

Supplements dated May 10, and August 1, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: SEP 20 1994

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
9033	10	USA/9033/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 September 24, 1993, as supplemented.

c. DOCKET NUMBER 71-9033

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 660, 660E, 660A, 660AE, 660B or 660BE

(2) Description

A steel encased uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, polyurethane potting material, uranium shield, "S" tube, and end plugs. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper proof seals are provided on the packaging. The maximum total weight of the package is approximately 53 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawings:

(i) Model No. 660B - Drawing No. 66025, Sheets 1, 2 and 3, Rev. F;

(ii) Model No. 660 - Drawing No. 66025, Sheets 1, 2, 3, and 4, Rev. B; or Drawing No. 66030, Sheets 1, 2, 3 and 4, Rev. -;

(iii) Model No. 660A - Drawing No. 66030, Sheets 1, 2 and 3, Rev. A; or Drawing No. 66030, Sheets 1, 2, and 3, Rev. D.

Model Nos. with an E suffix have an electrical circuit.

(b) Contents

(1) Type and form of material

Iridium-192 sources which meet the requirements of special form radioactive material.

5. (b) Contents (continued)

(2) Maximum quantity of material per package

(i) 140 Curies for the Model No. 660B or 660BE package.

(ii) 120 Curies for the Model No. 660, 660E, 660A or 660AE package.

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475 °F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.

7. The source assembly for use with this packaging is limited to Technical Operations, Inc. Model No. 424-9 as shown in Technical Operations, Inc. Drawing No. 42409, Rev. C.

8. The name plate must be fabricated of materials 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) The package must meet the Acceptance Test and Maintenance Program of Chapter 8.0 of the application, as supplemented; and

(b) The package shall be prepared for shipment in accordance with the Operating Procedures in Chapter 7.0 of the application, as supplemented.

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

11. Expiration date: October 31, 2000.

REFERENCES

Amersham Corporation Application dated September 24, 1993.

Supplement dated: March 31, 1994; June 28, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: AUG 10 1995

NRC FORM 618
(9-86)
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
9034	9	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 December 26, 1974, as supplemented.

c. DOCKET NUMBER 71-9034

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: TRIGA-I

(2) Description

TRIGA fuel element shipping container. The outer packaging is fabricated to DOT Specification 6J requirements. The outer dimensions are approximately 22.5 inches in diameter by 36 inches high. The inner vessel is a 5-inch Schedule 40 carbon steel pipe. Dimensions of the inner vessel are approximately 31 inches in height with a 1/4-inch thick wall and a 5-inch inside diameter. The top of the inner vessel is a threaded pipe cap and the bottom is a welded 1/4-inch thick flat disc. The inner vessel is centered and supported within the outer packaging by eight, 3/8-inch diameter braced, support spacer rods. The void between the inner vessel and the outer packaging is filled with vermiculite tamped to a minimum density of 4.5 lbs/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. D.

CONDITIONS *(continued)*

(b) Contents

(1) Type and form of material

TRIGA fuel elements containing uranium-zirconium-hydride or erbium-urarium-zirconium-hydride with nominal fuel composition (excluding erbium content) as described in Table A.1-1 of the June 9, 1992, submittal, 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 July 14, 1992, submittal. For enrichments of 20 w/o or greater U-235, uranium content not to exceed an A_2 quantity.

(c) Fissile Class I

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: May 31, 1995.

REFERENCES

General Atomic Company application dated December 26, 1974.

Supplements dated: February 7, 1975; January 16 and March 20, 1990; and June 9, July 14 (Enclosure dated July 10, 1992), August 25 and October 19, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: OCT 29 1992

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9035	11	USA/9035/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 September 6, 1994, 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, 680E, 680A, 680AE, 680B and 680BE

(2) Description

A steel encased uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, polyurethane potting material, depleted uranium shield, and an "S" tube. The contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. Tamper-proof seals are provided on the packaging and a 1/4-thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. The maximum weight of the package is 450 pounds.

(3) Drawings

The package is constructed in accordance with Sentinel, Amersham Corporation Drawing No. R68090, Rev. B, Sheets 1-5 and lock Drawing No. R85790, Rev. A, Sheets 1 and 2; 85791, Rev. A, Sheets 1 and 2; 67691, Rev. A; or 67692, Rev. A; as appropriate.

Model Nos. with an E suffix have an electrical circuit.

5. (b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

110 curies (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 shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475 °F fire environment for one half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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: April 30, 2000.

REFERENCES

Amersham Corporation application dated September 6, 1994.

Supplements dated: February 20, March 2, and April 24, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: April 28, 1995

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 Zircaloy-2 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.

Page 2 - Certificate No. 9036 - Revision No. 8 - Docket No. 71-9036

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 application 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

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

SEP 15 1995

Date: _____

NRC FORM 618
(8-86)
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
9037	9	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 December 26, 1974, as supplemented.

c. DOCKET NUMBER 71-9037

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: TRIGA-II

(2) Description

TRIGA fuel element shipping container. The outer packaging is fabricated to DOT Specification 6J requirements. The outer dimensions are approximately 22.5 inches in diameter by 55 inches high. The inner vessel is a 5-inch Schedule 40 carbon steel pipe. Dimensions of the inner vessel are approximately 50 inches in height with a 1/4-inch thick wall and a 5-inch inside diameter. The top of the inner vessel is a threaded pipe cap and the bottom is a welded 1/4-inch thick flat disc. The inner vessel is centered and supported within the outer packaging by eight, 3/8-inch diameter braced, support spacer rods. The void between the inner vessel and the outer packaging is filled with vermiculite tamped to a minimum density of 4.5 lbs/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. C.

(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 June 9, 1992, submittal, 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 July 14, 1992, submittal. For enrichments of 20 w/o or greater U-235, uranium content not to exceed an A_2 quantity.

(c) Fissile Class I

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: May 31, 1995.

REFERENCES

General Atomic Company application dated December 26, 1974.

Supplements dated: February 7, 1975; January 16 and March 20, 1990; and June 9, July 14 (Enclosure dated July 10, 1992), August 25 and October 19, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: OCT 29 1992

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
9039	8	USA/9039/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 April 11, 1980.

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-27683-2-318-gauge steel drum, 14-gauge clamp closure ring fastened by a bolt; 1.5 inches of Mil-I-2781 or Mil-2819 high temperature insulation; and a molded rubberized hair filler material. Overall dimensions of the overpack are approximately 15.5-inch diameter by 24-inch high. Maximum weight including contents is 105 pounds.

(3) Drawings

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

Model No.	Drawing Nos.
Overpack	A715, Rev. A
533	D53301, Rev. B
616	D61699, Rev. 0
644	D64400, Rev. I
713	C71301, Rev. 0
	D53301, Rev. B

CONDITIONS *(continued)*

Page 2 - Certificate No. 9039 - Revision No. 8 - Docket No. 71-9039

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

(i) 120 curies contained in the Model No. 533, Model No. 644 or Model No 713 radiographic device.

(ii) 240 curies contained in the Model No. 616 radiographic device.

6. Source assemblies for use in this packaging are limited to those assemblies as identified in Technital Operations, Inc. Drawing No. C42400, Rev. F, Sheet 2, and Sheet 3 of 3, and Drawing Nos. 42401, Rev. 0, 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 of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

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 Section 7 of the application.

(b) Each package must be tested and maintained in accordance with the acceptance tests and maintenance program in section 8 of the application.

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: June 30, 1995.

REFERENCE

Technical Operations, Inc. application dated April 11, 1980.

Supplement dated: May 31, 1990, October 18, 1990; and February 21, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles MacDonald

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: FEB 2 8 1991

NRC FORM 618
(8-89)
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	7	USA/9049/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
121 North Eagle Street
Geneva, OH 44041

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Advanced Medical Systems, Inc. application dated September 28, 1990

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

CONDITIONS *(continued)*

Page 2 - Certificate No. 9049 - Revision No. 7 - 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 G 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 packagings is not authorized.

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

12. Expiration date: December 31, 1995.

REFERENCES

Advanced Medical Systems, Inc. application dated: September 28, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 21 1990

NRC FORM 618
(9-83)
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
9053	6	USA/9053/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 June 16, 1980.

c. DOCKET NUMBER 71-9053

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 683

(2) Description

A radiographic exposure device contained within a protective overpack. The overpack is an 18-gauge, MS27683 steel drum with a bolted and seal wire clamp closure ring. The drum is filled with molded rubberized hair to maintain a snug fit. Overall dimensions are 19.5" diameter x 15" high. The radiographic exposure device consists of an 11-gauge carbon steel shell, depleted uranium shielding, Zircalloy "S" tube, polyurethane filler material, source shipping plug and lock assembly. Gross weight of the package is approximately 89 lbs.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos.: 68390; A68313, Rev. D; and C68303, Rev. A.

Page 2 - Certificate No. 9053 - Revision No. 6 - Docket No. 71-9053

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.

7. Source assemblies for use in this packaging are limited to those assemblies as identified in Technical Operations, Inc. Drawing Nos. 68309, Rev. E, and 68310, Rev. L.

8. Nameplate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. 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 Section 8 of the application, as supplemented.

(b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures of Section 7 of the application, as supplemented.

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

11. Expiration date: November 30, 1995.

REFERENCES

Technical Operations, Inc. application dated June 16, 1980.

Amersham Corporation supplements May 31, October 18, and November 16, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Dated: NOV 30 1990

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9056	10	USA/9056/B(U)	1	2

1. PREAMBLE
   a. This certificate is issued to certify that the packaging 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 13, 1989, 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 August 21, 1989, and January 5, 1992; and

(b) The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application, as supplemented January 5, 1992.

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: December 31, 1999.

REFERENCES

Source Production and Equipment Company, Inc., application dated March 13, 1989.

Supplements dated: July 6, August 21 and August 28, 1989; July 27, 1990; July 10 and November 4, 1991; January 5, 1992; and June 21, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

ate: 12/22/94

NRC FORM 618
(9-83)
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	6	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 quanity of material per package

Total contents not to exceed 200 pounds, 350 grams U-235 and type A quantities of radioactive materials

(c) Fissile Class III

Maximum number of packages per shipment 50

6. Special nuclear material shall be contained in secondary plastic bottles or jars, metal cans or jars or heavy plastic bags securely tied closed within the steel drum. Metal secondary containers must be capable of venting to avoid rupture of the package in the event the package is exposed to the thermal test, 10 CFR §71.73 (c)(3).

7. Fissile Class III shipments are restricted to shipments between the licensee's Sorrento Valley Fuel Manufacturing Facility and other on-site facilities.

8. 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, 1995.

REFERENCES

Gulf Energy & Environmental Systems application dated August 3, 1973.

General Atomics supplement dated August 16, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: SEP 19 1990

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
9067	4	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
EH-33.3
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) Drawing

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.

Page 2 - Certificate No. 9067 - Revision No. 4 - Docket No. 71-9067

5. (b) Contents

Type, form, and maximum quantity of material per package.

Byproduct material, source material, and special nuclear material not to exceed 300 watts decay heat. The material is in solid metal or oxide form packaged within an inner can assembly specified in Item 5(a)(3) above, or the material meets the requirements of special form radioactive material. Limitations on fissile loading for the Fissile Class are as follows:

Fissile Class I	100*
Fissile Class III	2000*

*(grams U-235 equivalent mass)

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

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

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

7. 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.

CONDITIONS *(continued)*

Page 3 - Certificate No. 9067 - Revision No. 4 - Docket No. 71-9067

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, 1997.

REFERENCES

U.S. Department of Energy application dated November 7, 1991.

Supplement dated: April 10, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAY 27 1992

NRC FORM 618
(9-88)
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	4	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
EH-33.3
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) Drawing

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

Type, form, and maximum quantity of material per package.

Byproduct material, source material, and special nuclear material not to exceed 200 watts decay heat. The material is in solid metal or oxide form packaged within the inner can assembly specified in Item 5(a)(3) above, or the material meets the requirements of special form radioactive material. Limitations on fissile loading for the Fissile Class are as follows:

Fissile Class I	50*
Fissile Class III	2,000*

*(grams U-235 equivalent mass)

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

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.

CONDITIONS *(continued)*

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, 1997.

REFERENCE

U.S. Department of Energy application dated November 7, 1991.

Supplement dated: April 10, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAY 27 1992

NRC FORM 618
(5-85)
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
9069	9	USA/9069/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)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Westinghouse Electric Corporation
application dated October 30, 1981,
as supplemented.

c. DOCKET NUMBER 71-9069

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: MO-1

(2) Description

Steel overpack consisting of a 12 gauge outer shell (45" x 47" x 206") and a 10 gauge inner shell (max. 37" x 37" x 186"). The volume between the shells is filled with a shock-and-thermal-insulating material consisting of rigid polyurethane foam. The upper and lower sections of the overpack are secured by 12 ratchet binders and 12 high strength 5/8" latch pins. The fuel assemblies are held in place within the overpack by a strongback and adjustable clamping assembly (shock mounted). Neutron absorber plates are located between the fuel assemblies. The package is equipped with lifting, tie-down and pressure relief devices. Gross weight of the package is 8,600 pounds.

(3) 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

(i) Unirradiated UO_2-PuO_2 PWR fuel assembly with the following maximum active dimensions and maximum compositions:

Cladding Material	Zr
Envelope, in	7.784 x 7.784
Enrichment	
PuO_2 in PuO_2, plus UO_2 w/o	*(a)
PuO_2 fissile in PuO_2, w/o	*(b)
UO_2 fissile in UO_2, w/o	0.71
Fissile, kg	16.6
Fuel length, in	144
Decay heat load, watts/pkg	400

*For three plutonium isotopic cases:
Case 1,
the PuO_2 enrichment (a) is 6.0 w/o; fissile PuO_2 (b) is 71 w/o.
Case 2,
the PuO_2 enrichment (a) is 4.4 w/o; fissile PuO_2 (b) is 81 w/o.
Case 3,
the PuO_2 enrichment (a) is 3.03 w/o; fissile PuO_2 (b) is 85 w/o.

(ii) Mixed PuO_2 in natural UO_2 as pressed sintered pellets fully clad in leak-tight Zircaloy of minimum 0.024" thickness as fuel rods of the following specifications:

Type	
Pellet diameter (nom), in	0.365
Rod diameter (nom), in	0.422
Fuel length (nom), in	120 to 144
PuO_2 in PuO_2 plus UO_2, w/o	6.0
PuO_2 Fissile in PuO_2, w/o	85
UO_2 fissile in UO_2, w/o	0.71

(iii) Uranium dioxide as stainless steel or aluminum clad unirradiated rods of the following specifications:

	SST Clad	AL Clad
Pellet diameter (max), in	0.446	0.406
Rod diameter (nom), in	0.476	0.475
Fuel length (max), in	70.0	61.0
^{235}U enrichment (max), w/o	4.02	2.5

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

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

Two fuel assemblies.

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

Not more than 94 kilograms Pu contained within the fuel rod container described in 5(a)(3).

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

Two inner containers as described in 5(a)(3) containing not more more than a total of 70 kilograms U-235.

(c) Fissile Class — II and III

(1) Minimum transport index to be shown on label for Class II — 1.6

(2) Maximum number of packages per shipment for Class III — 62

6. Two (2) neutron absorber plates consisting of 0.19" thick, full length, stainless steel containing 1.3 percent minimum boron or 0.19" thick OFHC copper must be installed between the active area of the fuel assemblies.

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

8. Each fuel assembly must be unsheated 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.

CONDITIONS *(continued)*

Page 4 - Certificate No. 9069 - Revision No. 9 - Docket No. 71-9069

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: January 31, 1997.

REFERENCES

Westinghouse Electric Corporation application dated October 30, 1981.

Supplement dated January 24, 1992.

Department of Energy supplements dated: April 2 and June 14, 1984.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 29 1992

NRC FORM 618
(5-86)
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
9070	12	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*)

VECTRA Technologies, Inc.
1010 South 336th Street
Suite 220
Federal Way, WA 98003

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

(i) Radioactive material in the form of dewatered, solid or solidified materials meeting the requirements of low specific activity material, contained in steel drums.

(ii) Radioactive material meeting the requirements of special form radioactive material, contained in steel drums.

(iii) 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: December 31, 1999.

REFERENCES

VECTRA Technologies, Incorporated, application dated July 21, 1994.

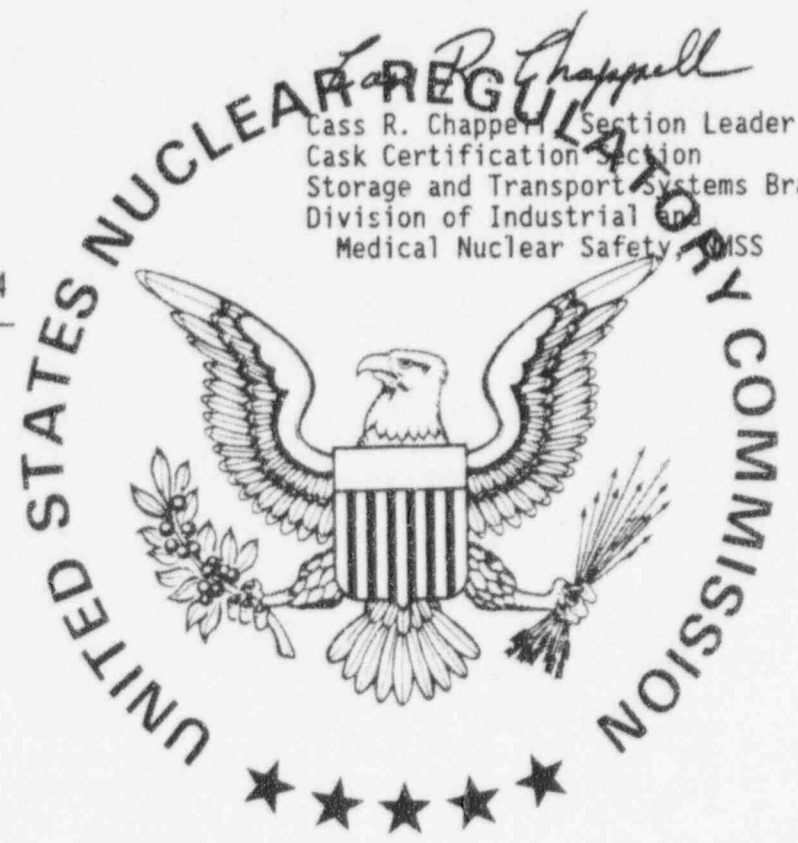
Supplements dated: August 22 and October 20, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

for C. R. Chappell

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

Date DEC 20 1994



NRC FORM 618
(8-86)
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
9071	5	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 433
Ridgefield, CT 06877

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. 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: December 31, 1996.

Page 3 - Certificate No. 9071 - Revision No. 5 - Docket No. 71-9071

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; and September 26, and December 12, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: DEC 17 1991

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
9073	18	USA/9073/A	1	3

2. PREAMBLE

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

Scientific Ecology Group, Inc.
P.O. Box 2530
1560 Bear Creek Road
Oak Ridge, TN 37831-2530

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Scientific Ecology Group, Inc., application dated January 26, 1994.

c. DOCKET NUMBER 71-9073

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 10-142A

(2) Description

A steel encased, lead shielded cask for solid radioactive material. The overall dimensions of the cask are 101-inch diameter by 120-inch height. The cask consists of two concentric carbon steel cylindrical shells surrounding a 3-1/2-inch thick lead shield. The 1/2-inch thick inner shell has a 66-inch ID, and the 1-inch thick outer shell has a 76-1/4-inch OD; the base consists of two, 3-inch thick welded steel plates. The base is welded to the steel cylindrical shells. A stepped welded lid, secured by eight ratchet binders, is comprised of two, 3-inch thick steel plates containing openings for a secondary lid of similar construction with an additional 1-inch thick upper plate. The secondary lid is secured to the primary lid through eight, 1-inch diameter bolts. The containment cavity is 66 inches in diameter by 72 inches high. The package design is provided with a lid test port. Toroidal impact limiters are located at the top and bottom of the cask. The impact limiters are 10-gauge stainless steel filled with rigid polyurethane foam. Interior and exterior surfaces of the cask body and interior surfaces of the upper lid are covered with 12-gauge, 304 stainless steel cladding and seal welded.

The primary lid is closed by means of eight ratchet binders. The 29-inch diameter secondary lid is closed by eight, 1-inch diameter stud bolts. Both lids are sealed using silicone gaskets bonded to the lid plates. Lifting is facilitated with three lugs welded to the primary lid. The secondary lid has a redundant Neoprene seal, and a centrally located lift lug.

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 64,000 pounds.

5. (a) (3) Drawings

The packaging is fabricated in accordance with Scientific Ecology Group, Inc., Drawing No. STD-02-107, Sheets 1 and 2, Rev. 0.

(b) Contents

(1) Type and form of material

(i) Dewatered ion exchange resins or solid waste meeting the requirements for low specific activity material in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantities of radioactive materials which may contain fissile contents not to exceed the generally licensed mass limits as specified in 10 CFR §§§71.18, 71.20, and 71.22. 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:

(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. 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 conditions.

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

   (a) Prior to each shipment, the packaging lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first. The cavity test port must be sealed with appropriate sealant applied to the pipe plug threads.

   (b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in chapter 7 of the application.

   (b) The package must meet the Acceptance Tests and Maintenance Program in chapter 8 of the application.

9. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

10. Packagings fabricated after March 28, 1980 must be constructed of A-516 Grade 70 carbon steel.

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

12. Expiration date: February 28, 1999.

REFERENCES

Scientific Ecology Group, Inc., application dated January 26, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: FEB. 2 8 1994

NRC FORM 618
(5-85)
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
9079	15	USA/9079/A	1	3

PREAMBLE

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

Pacific Nuclear Systems, Inc.
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Packaging Inc. application
dated March 30, 1988, as supplemented.

c. DOCKET NUMBER 71-9079

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: NUPAC 14D-2.0

(2) Description

Steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 81-1/2 inches high by 81-3/4 inches in diameter. the cask cavity is 73-3/8 inches high by 75-1/2 inches in diameter. The cask side wall consists of a 3/8-inch thick inner steel shell, a 1-3/4-inch lead shell, and a 7/8-inch thick outer steel shell. Each base is comprised of two, 2-inch thick steel plates welded together to form a 4-inch thick base which is intergerally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is comprised of two, 2-inch thick steel plates, which are stepped and welded together to mate with the steel flange. The cask closures are sealed by a Neoprene gasket located between the lid and steel flange, positive closure of the lid is accomplished by eight rachet binders. The lid contains a centrally located shield plug comprised of two, 2-inch thick steel plates and one, 1-inch thick steel plate stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nut are used to provide positive closure.

Tie-down is accomplished by four tie-down lugs welded to the cask body. There are four cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 48,000 pounds.

Page 2 - Certificate No. 9079 - Revision No. 15 - Docket No. 71-9079

(a) Continued

(3) Drawings

The Model No. NUPAC 14D-2.0 packaging is fabricated in accordance with Nuclear Packaging, Incorporated Drawing No. X-20-215D, Revision C.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents and secondary containers shall not exceed 14,000 pounds and the internal decay heat load shall not exceed 7 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by test 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°); 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.

8. The lid and shield plug lifting lugs must not be used for lifting the cask, and shall be covered in transit.

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

(a) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first. Cavity drain line and optional vent/test connection must be sealed with appropriate sealant applied to the pipe plug threads.

(b) Each cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask must be leak tested at least once every twelve (12) months in accordance with Appendix 8.4 of the application.

(c) The package shall be prepared for shipment and operated in accordance with the operating procedures of Section 7.0 of the application.

10. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

13. Expiration date: June 30, 1998.

REFERENCES

Nuclear Packaging, Incorporated application dated March 30, 1988.

Supplement dated: April 26, 1989 and February 23, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: APR 27 1993

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
9081	10	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, Inc.
220 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. 5; 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 by product 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.

Page 3 - Certificate No. 9081 - Revision No. 10 - Docket No. 71-9081

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: December 31, 1997.

REFERENCE

Chem-Nuclear Systems, Inc. application dated November 24, 1987.

Supplement dated: November 24, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: DEC 14 1992

NRC FORM 618
(8-86)
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
9086	15	USA/9086/A	1	3

2. PREAMBLE

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

Scientific Ecology Group, Inc.
P.O. Box 2530
1560 Bear Creek Road
Oak Ridge, TN 37831-2530

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for the HN-190-1
Radwaste Shipping Cask STD-R-02-006
Revision 4.

c. DOCKET NUMBER 71-9086

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: HN-190-1

(2) Description

A steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 82.5 inches high by 81.5 inches in diameter. The cask cavity is 74.5 inches high by 75.63 inches in diameter. The cask side wall consists of a 3/8-inch thick inner steel shell, a 1-3/4-inch lead shell, and a 7/8-inch thick outer steel shell. The base is a 4-inch thick steel plate which is welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is a 4-inch thick steel plate which is stepped to mate with the steel flange. The cask closure is sealed by a Viton or Buna-N O-ring gasket located between the lid and steel flange. Positive lid closure is accomplished by thirty, 1-inch studs and nuts. The lid contains a centrally located 4-inch stepped steel shield plug. The shield plug is sealed by a Viton or Buna-N O-ring gasket, and sixteen, 1/2-inch studs and nuts are used to provide positive closure.

Tie-down is accomplished by four-tie down lugs welded to the cask body. There are three cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is 50,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Hittman Nuclear & Development Corporation Drawing Nos. STD-02-028, Revision 9; STD-02-029, Revision 6; and STD-02-030, Revision 5.

5. (b) Contents

(1) Type and form of material

Process solids either dewatered, solid or solidified meeting the requirments for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 14,500 pounds except the weight of the contents in HN-100 Series 1, Unit 5 must not exceed 6,900 pounds. Internal decay heat must not exceed 7 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements or by analysis of a representative pakcage 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 transort, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

8. The lid and shield plug liftng lugs must not be used for lifting the cask, and shall be covered in transit.

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

(a) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken,), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, whichever occurs first.

(b) Each packaging must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

(c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Sectin 7.0 of the application.

10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold on deck of a seagoing vessel assigned for the sole use of the licensee.

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

12. Expiration date: July 31, 1998.

REFERENCES

Scientific Ecology Group, Inc. application dated May 18, 1993.

Supplement dated June 23, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUL 13 1993

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
9089	11	USA/9089/A	1	3

PREAMBLE

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

Scientific Ecology Group, Inc.
P.O. Box 2530
1560 Bear Creek Rd.
Oak Ridge, TN 37831-2530

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Westinghouse Hittman Nuclear, Inc.
Application dated October 28, 1988,
as supplemented.

c. DOCKET NUMBER 71-9089

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: HN-194S

(2) Description

The cask is a steel annulus 84-1/4 inches high by 81-5/8 inches in diameter. The cavity is 75-1/2 inches high by 75-5/8 inches in diameter. The side walls consist of two plys of 1-1/2-inch steel. The 3-inch steel base is integrally welded to the cylinder. The lid is a 3-inch steel plate, stepped to mate with the upper flange of the cylinder. A centrally located shield plug is similarly constructed. The lid and plug are attached with stud-bolts and nuts and sealed with Buna N O-ring gaskets. A plugged drain line and/or optional vent/test in the secondary lid connection is provided. Four skewed lugs welded to the outer shell are used for tie down. There are three cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 43,000 pounds.

(3) Drawings

The packaging is fabricated in accordance with Westinghouse Hittman Nuclear, Inc. Drawing Nos.: STD-02-078, Rev. 1 and STD-02-079, Rev. 0.

5. (b) Contents

(1) Type and form of material.

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package.

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents, secondary containers, and shoring must not exceed 17,000 pounds and the internal decay heat load must not exceed 2 thermal watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between the secondary containers and cask cavity to minimize movement during normal conditions of transport.

8. The lid and shield plug lifting lugs must not be used for lifting the cask, and shall be covered in transit.

9. Packagings without a drain line must be provided with the optional vent/test connection in the cask secondary lid.

10. The drain line and optional vent/test connection must be appropriately plugged and sealed prior to transport.

11. Prior to each shipment, the packaging lid seals, if opened (or if the security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve months, whichever occurs first.

12. The packaging must be leak tested at least once every twelve months in accordance with Leak Test Procedure STD-P-02-002, Rev. 3, dated August 18, 1989. Each cask which has been damaged or repaired in the area of a seal must also be tested prior to subsequent use; normal gasket maintenance does not require a subsequent test.

13. Packagings fabricated after November 30, 1983, must be constructed of A-516, Grade 70 carbon steel.

14. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the license.

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

16. Each package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

17. Packaging fabricated in accordance with Hittman Nuclear & Development Corporation Drawing Nos. C001-5-9128, Rev. 5 and C001-5-9129, Rev. 3 are not authorized after April 1989.

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: February 28, 1999.

REFERENCES

Westinghouse Hittman Nuclear, Incorporated application dated October 28, 1988.

Supplements dated: January 26, 1989, and December 22, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: FEB 28 1994

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
9094	11	USA/9094/A	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 May 1, 1985, as supplemented.

c. DOCKET NUMBER 71-9094

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 14-195-H

(2) Description

A steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder 83-1/8-inch diameter by 89-7/8-inch with a 77-inch diameter by 80-1/8-inch cavity. Lead shielding is 2-3/16-inch thick, and is encased in an outer steel shell 3/4-inch thick and an inner steel shell 1/8-inch thick. Positive closure of the silicone rubber-sealed lid is provided by twelve, 1-1/4-inch diameter cap screws. A secondary lid with a Neoprene seal uses eighteen, 3/4"-10UNC bolts for closure. The cask is welded to a 96-inch square based plate, has two lifting trunnions, three lid lift rings and one secondary lid lifting ring. Package gross weight is 56,500 pounds.

(3) Drawings

The packaging is fabricated in accordance with Chem-Nuclear Systems, Inc. Drawing No. 1-189-101, Sheet 1 of 1, Rev. A-G. The optional shield inserts are fabricated in accordance with Chem-Nuclear Systems, Inc. Drawing No. C-119-B-0017, Rev. 2.

(b) Contents

(1) Type and form of material

(i) Process solids, either dewatered, solid or solidified in secondary containers, meeting the requirements for low specific activity material; or

(ii) Solid reactor components in secondary containers, as required that meet the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers, shield inserts and shoring not exceeding 17,700 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:

(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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring must be placed between secondary containers (or activated components), and the cask cavity to prevent movement during normal conditions of transport.

8. The lid lifting lugs must not be used for lifting the cask and shall be covered in transit.

CONDITIONS *(continued)*

Page 3 - Certificate No. 9094 - Revision No. 11 - Docket No. 71-9094

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

   a. Prior to each shipment the lid gaskets if opened (or if security seal is broken), must be inspected. These gaskets shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

   b. The package shall be prepared for shipment and operated in accordance with Section 7.0, Operating Procedures, in the application dated May 1, 1985, and supplements dated August 26, 1985 and August 23, 1990.

   c. The package must be maintained in accordance with Section 8.0, Test and Maintenance, in the application dated May 1, 1985.

10. Fabrication of additional packagings is not authorized.

11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

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

13. Expiration date: October 31, 1995.

REFERENCE

Chem-Nuclear Systems, Inc. application dated May 1, 1985.

Supplements dated: August 26, 1985, August 23, 1990 and December 4, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 13 1993

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
9096	11	USA/9096/A	1	3

1. PREAMBLE

a. This certificate is issued to certify that the packaging 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 August 26, 1985.

c. DOCKET NUMBER 71-9096

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 21-300

(2) Description

A steel encased lead shielded cask for low specific activity radioactive material. The cask is a right circular cylinder with 66-3/4-inch OD by 111-1/4-inch height, and a cavity 48-inch diameter by 100-inch height. The 1-inch thick lead shield is supported by outer and inner steel shells 3/4-inch and 1/8-inch thick. The inner plates of the lid and base are laminated steel plates with a total thickness of 1/2-inch. Positive closure of the silicone rubber sealed lid is provided by twelve, 1-1/4-inch diameter cap screws. A secondary lid with a Neoprene seal uses eighteen, 3/4-inch diameter bolts for closure. The cask is welded to a 96-inch square base plate and has two lifting trunnions, three lid lift rings and one secondary lid lift ring. Package gross weight is 57,450 pounds.

(3) Drawings

The packaging is fabricated in accordance with Chem-Nuclear Systems, Inc. Drawing Nos. 1-298-101, Rev. K, and C-114-D-0006, Rev. C.

5. (b) Contents

(1) Type and form of material

(i) Process solids, either dewatered, solid or solidified in secondary containers, meeting the requirements for low specific activity material; or

(ii) Solid reactor components in secondary containers, as required that meet the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers, auxiliary shield and shoring not exceeding 27,250 pounds.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 20°C [68°F]).

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

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

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring must be placed between secondary containers (or activated components) auxiliary shield, and the cask cavity to prevent movement during normal conditions of transport.

8. The auxiliary shield shown in Drawing No. C-114-E-0004, Rev. No. B, may be used for shipment of solidified wastes and solid reactor components.

9. The lid lifting lugs must not be used for lifting the cask and shall be covered in transit.

10. Prior to each shipment the lid gaskets if opened (or if security seal is broken), must be inspected. The gaskets shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

11. 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 Section 7.0, Operating Procedures, in the application dated August 26, 1985.

    (b) The package must be maintained in accordance with Section 8.0, Tests and Maintenance, in the application dated August 26, 1985.

12. Fabrication of additional packagings is not authorized.

13. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

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

15. Expiration date: September 30, 2000.

REFERENCE

Chem-Nuclear Systems, Inc. application dated August 26, 1985.

Chem-Nuclear Systems, Inc. supplements dated August 23, 1990 and August 28, 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

SEP 15 1995

Date: _____

NRC FORM 618
(9-83)
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
9098	7	USA/9098/B( )	1	3

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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
Transportation & Packaging
Safety Division, EH-33.2
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Cintichem Inc. application dated
August 20, 1987, 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. C and 100964, Rev. G

Model No. CI-20WC-2A
101354, Rev. F and 101326, Rev. D

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 and PO-06) 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 procedures (PO-07) of submittal dated February 3, 1993. 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: February 28, 1998.

REFERENCES

Cintichem Inc. application dated August 20, 1987.

Department of Energy supplements dated: July 15, September 18, and December 21, 1992; and February 3, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: FEB 26 1993

NRC FORM 618
(8-89)
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	5	USA/9099/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)

U.S. Department of Energy
EH-33.2
Washington, DC 20545

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

EG&G, ATR Fuel Element Shipping Container Safety Analysis, EGG-ATRO-7737 (Rev. 1), August 19, 1987, 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.

5. (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 93 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) Fissile Class II

Minimum Transport Index 4.1

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. Each package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of supplement dated August 27, 1993.

8. The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7.0 of supplement dated August 27, 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: January 31, 1999.

REFERENCES

EG&G, ATR Fuel Element Shipping Container Safety Analysis, EGG-ATRO-7737 (Rev. 1), August 19, 1987

Supplements dated: June 11, 1993, and August 27, 1993

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JAN 25 1994

NRC FORM 618
(9-86)
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
9102	7	USA/9102/B( )	1	2

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 wooden overpack. The cask is 24 inches in diameter with a 3/8-inch thick steel spherical shell and a cavity formed by an 8-1/4-inch ID by 3/8-inch thick steel tube. Positive closure of the shielded cask is accomplished by bolted end covers at each end of the cavity. The 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 closure 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 package gross weight is 6,000 pounds.

(3) Drawings

The Model No. NPI-20WC-6 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.

5. (b) Contents

(1) Type and form of material

Cobalt 60, as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

The maximum activity 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 Tests 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, 1998.

REFERENCES

Neutron Products, Incorporated application dated August 31, 1977.

Supplements dated: February 6, 1978; July 31, 1985; August 2 and September 7, 1988, and September 21, 1993

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Dated: NOV 09 1993

NRC FORM 618
(5-86)
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
9107	5	USA/9107/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 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

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

110 curies

6. Source assemblies for use in this packaging are limited to those assemblies as identified in Section 1-3 of Technical Operations, Inc. application dated December 30, 1982.

7. Nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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 supplements dated February 16, April 13, and April 28, 1993; and,

   (2) Each package must be maintained and acceptance tested in accordance tested in with Chapter 8 of the supplements dated February 16, April 13, and April 28, 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: May 31, 1998.

REFERENCES

Technical Operations, Inc., application dated December 30, 1982.

Supplements dated February 16, April 13, and April 28, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

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
9108	9	USA/9108/A	1	3

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 May 31, 1983, as supplemented.

c. DOCKET NUMBER 71-9108

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 6-75

(2) Description

The packaging is a steel encased, lead shielded right circular cylinder for low specific activity radioactive material. The outside dimensions are 62 inches in diameter by 86-5/8 inches long and the cavity dimensions are 53 inches in diameter by 74-1/2 inches long. The 3-1/4-inch annulus between the outer 3/4-inch and inner 1/2-inch steel shells is filled with lead. The base plate consists of a 64-3/4-inch square 1-inch outer plate, 3 inches of lead and a 1/4-inch outer plate. The cover consists of a 1-inch steel outer and a 1/2-inch thick steel inner plate with 2-7/8 inches of lead shielding. A secondary cover, plugging the 20-inch central opening in the cover, is constructed of a 1/4-inch outer plate, 1-1/2 inches of lead, a 1/2-inch plate, 1-3/4 inches of lead and a 1/4-inch inner plate. The covers are Neoprene gasketed and secured by sixteen, 3/4-inch and eight, 5/8-inch bolts, respectively. The cavity is vented through a 1/8-inch plugged tube through the cover and drained through a 1/2-inch plugged tube at the bottom. Three lugs on the cask sides, cover ribs and secondary cover are provided for lifting. Four lugs on the cask shell are used for tie-down. Package gross weight is about 41,300 pounds.

(3) Drawing

The packaging is fabricated according to Chem-Nuclear Systems, Inc., Drawing No. 1036-D-01, Sheets 1 and 2, Revision M.

(b) Contents

(1) Type and form of material

Dewatered or solidified waste meeting the requirements of low specific activity material in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 10,300 pounds. The decay heat load shall not exceed 20 watts.

6.(a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 with could have hydrogen greater than 5%.

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

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between the secondary containers and the cask cavity to prevent movement during normal conditions of transport.

8. The cover lifting lugs must not be used for lifting of the cask and must be plugged or covered in transit.

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

(a) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve months, whichever occurs first. A determination must be made that closure seal replacement is current with the seal replacement schedule. Cavity drain line and vent connections must be sealed with appropriate sealant applied to the pipe threads.

(b) The packaging must be maintained in accordance with the Maintenance Program of Section 5.0 of the application, as supplemented. In addition, the cask must be leak tested at least once every twelve months in accordance with Subsection 5.2.5 of the application.

(c) The package shall be prepared for shipment and operated in accordance with the operating procedures of Section 4.0 of the application, as supplemented.

10. Fabrication of additional packaging after October 31, 1983 is not authorized.

11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

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

13. Expiration date: September 30, 1998.

REFERENCES

Chem-Nuclear Systems, Incorporated, application dated May 31, 1983.

Supplements dated: September 9, 1983; January 27, 1984; August 26, 1988; and August 27, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Carl J. Withee for

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

Date: SEP 17 1993

NRC FORM 618
(5-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9111	13	USA/9111/A	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 June 29, 1983, as supplemented.

c. DOCKET NUMBER 71-9111

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: CNS 6-80-2 and CNS 6-80-2A

(2) Description

A steel encased, lead shielded cask for solid radioactive material meeting the requirements for low specific activity material. The overall dimensions of the cask are 70-1/2-inch diameter by 78-5/8-inch height. The cask consists of two concentric carbon steel cylindrical shells surrounding a 4-1/4-inch thick lead shield. The 3/8-inch thick inner shell has a 59-inch ID, and the 1-inch thick outer shell has a 70-1/2-inch OD; the base consists of two, 4-inch thick welded steel plates of 60-inch diameter and 70-1/2-inch diameter, and a stepped welded lid comprised of two, 4-inch thick steel plates containing a centered 29-inch diameter secondary lid of similar construction with an additional 1-inch thick upper plate. The containment cavity is 59-inch diameter by 58-inches high. Closure of the primary lid is accomplished by eight, 1-1/4-inch bolts or studs and nuts. Both lids on Model No. CNS 6-80-2 are sealed using silicone gaskets. The secondary lid has a redundant Neoprene seal. Both lids on Model No. CNS 6-80-2A are sealed using a double O-ring configuration as shown on Drawing No. C-110-D-0020, Rev. A. A plugged drain port is located at the cask bottom. The cask is lined with 12 gauge stainless steel. Three lift lugs, located on the secondary lid are used for lifting both the cask and the primary lid. Four lugs, welded to the outer shell are used for tie-down. The package gross weight is approximately 51,500 pounds.

(3) Drawing

The packaging is fabricated in accordance with Chem-Nuclear Systems, Incorporated Drawing No. C-110-D-0028, Sheets 1 and 2 of 2, Revision B or optional lid seal configuration given in Drawing No. C-110-D-0020, Revision A, for the Model No. CNS 6-80-2A.

5. (b) Contents

(1) Type and form of material

(i) Greater than Type A quantity of byproduct material contained in solids and solidified waste, meeting the requirements for low specific activity material, in secondary containers.

(ii) Greater than Type A quantity of byproduct material contained in activated solid components meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 7,500 pounds. The decay heat load must not exceed 60 watts. The contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 the package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which the determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.

8. The cavity drain line must be sealed with appropriate sealant applied to the pipe plug threads prior to transport.

9. Packages must be leak tested initially and at least once every 12 months, as specified in Subsection 8.1.3 of the Safety Analysis Report as revised December 19, 1988. The cavity or volume between the double O-ring seals (Model No. CNS 6-80-2A) shall be pressurized to 14.0 psig. Seal acceptance must be based on no observable leakage over a ten minute period using a pressure gauge with a maximum graduation of two pounds and the pressure supply line disconnected from the cask and test fixture.

10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold on deck of a seagoing vessel assigned for sole use of the licensee.

11. Each package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the Safety Analysis Report of June 29, 1983, as revised September 19, 1983 and December 19, 1988.

12. The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the current Safety Analysis Report of June 29, 1983, as revised September 19, 1983 and December 19, 1988.

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: January 31, 1999.

REFERENCES

Chem-Nuclear Systems, Incorporated application dated June 29, 1983.

Supplements dated: September 19, 1983, December 19, 1988 and December 28, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

JAN 11 1994

Date: _____

NRC FORM 618
(8-89)
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
9126	7	USA/9126/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:

Amersham Corporation application dated March 9, 1989, as supplemented

c. DOCKET NUMBER 71-9126

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: 20, 20A, 50 and 50A

(2) Description

A steel-encased, uranium-shielded, radiographic device. The shipping container is approximately 21 inches long, 23 inches wide, and 32 inches high. The radioactive source assembly is housed in a Zircalloy or titanium "S" tube. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The gross weight of the container is 325 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing No. 821-1001-128, Rev. 2, Sheets 1 and 2.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements for special form radioactive material.

(2) Maximum quantity of material per package

Model No.	Quantity
20 and 20A	20 curies
50 and 50A	50 curies

6. The source shall be secured in the shielded position of the packaging by the safety plug assembly, source assembly, and lockbox assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1475 °F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and safety plug assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The can and side plates must be a minimum of 1/4-inch thick carbon steel. The can and side plates shall be joined by full penetration welds. All other welds shall be fillet welds having sufficient throat thickness to develop strength equal to or greater than the metals being joined.

8. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. In addition to the requirements of Subpart G of 10 CFR Part 71, the package must be operated and maintained in accordance with the operating procedures and maintenance program in Chapters 7 and 8 of supplement dated September 27, 1994.

10. Fabrication of new 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: October 31, 1999.

REFERENCES

Amersham Corporation application dated March 9, 1989.

Supplement dated: August 21, 1989; and September 27, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

NOV 0 8 1994

Date: _____

NRC FORM 618
(5-89)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9127	7	USA/9127/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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
March 9, 1989 as supplemented

c. DOCKET NUMBER

71-9127

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos. 100, 100A, 200 and 200A

(2) Description

A steel encased, uranium shielded radiographic device. The shipping container is approximately 27 inches long, 23 inches wide and 42 inches high. The radioactive source assembly is housed in a Zircalloy or titanium "S" tube. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The gross weight of the container is 500 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing Nos. 821-1001-128, Rev. 2; Sheets 1 and 2.

(b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Model No.	Quantity
100 and 100A	100 curies
200 and 200A	200 curies

6. The source shall be secured in the shielded position of the packaging by the safety plug assembly, source assembly and lockbox assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and safety plug assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The can and side plates must be a minimum of 1/4-inch thick carbon steel. The can and side plates shall be joined by full penetration welds. All other welds shall be fillet welds having sufficient throat thickness to develop strength equal to or greater than the metals being joined.

8. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. In addition to the requirements of Subpart G of 10 CFR Part 71, the package must be operated and maintained in accordance with the procedures in Section 7 and Section 8 of the application.

10. Fabrication of new 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: October 31, 1999.

REFERENCES

Gamma Industries application dated March 9, 1989.

Supplement dated: August 21, 1989; September 27, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: NOV 01 1994

NRC FORM 618
(6-85)
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
9128	6	USA/9128/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)

Amersham Corporation
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Amersham Corporation application dated March 9, 1989, as supplemented

c. DOCKET NUMBER 71-9128

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: C-8

A steel encased, uranium shielded source exchanger. The shipping container is approximately 16 inches in diameter, 13 inches long and 26 inches high in its skid mounted configuration. The radioactive source assembly is housed in a Zircaloy or titanium "S" tube. A septum at the center of the "S" tube prevents moving the source assembly beyond the optimum shielding position. The tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a steel housing. The void space between the depleted uranium shield assembly and the outer container is filled with a polyurethane foam. The gross weight of the container is 500 pounds.

(3) Drawings

The packaging is constructed in accordance with Gamma Industries Drawing Nos. 821-1001-033, 180-01, 191, 821-1005-008D, 821-1001-117, 821-1001-128, 821-1001-129, 811-1001-212, 811-1001-111, and 801-1001-159.

5. (b) Contents

(1) Type and form of material

Cobalt 60 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

200 curies

6. The source shall be secured in the shielded position of the packaging by the safety cap, source assembly and lockbox assembly. The components used to secure the source must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly must be of sufficient length and diameter to provide positive positioning of the source at the septum in the shielded position.

7. The can and side plates must be a minimum of 1/4-inch thick carbon steel. The can and side plates shall be joined by full penetration welds. All other welds shall be fillet welds having sufficient throat thickness to develop strength equal to or greater than the metals being joined.

8. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. Use of packaging fabricated after January 31, 1991 is not authorized.

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 March 9, 1989 application as supplemented.

b. The package must be maintained in accordance with the Acceptance Tests and Maintenance Program of Section 8.0 of the March 9, 1989, 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: February 28, 1996

REFERENCES

Amersham Corporation application dated March 9, 1989.

Supplements dated: August 21, and September 23, 1989; February 8, and December 6, 1990; and January 29, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: FEB 12 1991

NRC FORM 618
(9-83)
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	12	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
EH-32
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Packaging, Inc. application
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/ft^3) impact limiters. The overall dimensions are 213.2 inches in length and 52 inches in diameter. The cask without the impact limiters measures 177.2 inches in length and 26.44 inches in diameter.

The outer cask shell is comprised of a one-inch thick stainless steel shell 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 2 Viton O-ring seals. The top end of the containment vessel is sealed with a 11.625-inch thick stainless steel plug with 2 Viton O-ring seals. The bottom plug is retained by a closure plate secured by 8, 1/2"-13UNC x 2-1/4-inch ASTM A320, Grade L7 socket head cap screws. The top plug is secured in place utilizing 16, 1/2"-13UNC x 1-3/4-inch ASTM A320, Grade L7 hex flange screws.

5. (a) Packaging (continued)

No drain or vents penetrate directly into the containment vessel. A drain/vent line opens directly into the area between the 2 O-ring seals at each end of the cask (end plugs). During shipment, the lines are sealed with Viton O-ring sealed threaded fasteners.

The cask is provided with 6 trunions, 4 spaced 90 degrees apart at the top end and two spaced at 180 degrees apart at the bottom end of the cask. The cask is tied down at the forward and aft ends by means of a cradle and yoke assembly. The gross weight of the cask and contents is 38,200 pounds.

(3) Drawing

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-3-47477, 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.

(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
(1)	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
(2)	217-Pin MOX Fuel Pins	50% max PuO + 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
(3)	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

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5. (b) Contents (continued)

	Type	Fuel Description*	Array Description	Maximum Fissile Package Loading	Pin Dimensions
(4)	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
(5)	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
(6)	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
(7)	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
(8)	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
(9)	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
(10)	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
(11)	Structural Components (incl. Control assemblies)	Dosimetry Foils	—	1.0 kg	—

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(12)	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
(13)	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) Fissile Class III

Maximum number of packages per shipment One

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.

CONDITIONS *(continued)*

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. D.) must be torqued to 70 ± 10 ft-lb.

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

12. Expiration Date: March 31, 1996.

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; and March 22, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: APR 8 1991

NRC FORM 618
(9-83)
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
9137	3	USA/9137/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 November 9, 1979.

c. DOCKET NUMBER 71-9137

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 820

(2) Description

A steel encased, uranium shielded source changer. Primary components consist of an outer stainless steel shell, polyurethane potting material, uranium shield, eight Titanium "J" tubes, source stop, and top and bottom support plates. The contents are securely positioned within the "J" tubes by means of a source cable locking device. The package has an outside diameter of 19-1/2 inches and outside length of 21-1/2 inches. The maximum total weight of the package is approximately 222 pounds.

(3) Drawing

The packaging is constructed in accordance with Technical Operations, Inc. Drawing No. 82090, Sheets 1 through 4.

Page 2 - Certificate No. 9137 - Revision No. 3 - Docket No. 71-9137

(b) Contents

(1) Type and form of material

Iridium 192 sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

1,000 curies with no more than 240 curies in a single source.

6. 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.

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, 1995.

REFERENCE

Technical Operations, Inc. application dated November 9, 1979.
Amersham Corporation supplements dated August 22, 1989, May 4, and October 19, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 0 9 1990

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
9139	7	USA/9139/A	1	3

2. PREAMBLE

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

Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated March 24, 1980, as supplemented.

c. DOCKET NUMBER 71-9139

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 589

(2) Description

A steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder with 79-inch OD by 80-inch height, and a cavity 74-inch ID by 74-inch height. The 1.5-inch thick lead shield is supported by outer and inner carbon steel shells 0.75-inch and 0.375-inch thick, respectively. The bottom 1.56-inch thick lead shield is supported by outer and inner carbon steel plates 1.0-inch and 0.375-inch thick, respectively. The 1.5-inch thick lead lid shield is supported by outer and inner carbon steel plates 1-inch and 0.5-inch thick, respectively. The carbon steel used is SA516, Grade 70. The lid is attached to the cask with eight (26,000 lb proof load each) ratchet type load binders and sealed with a Buna N O-ring. The cask is equipped with a 3/4-inch drain line, sixteen-hold bolt-down flange (1-inch bolts) and two 2-1/2-inch diameter lifting lugs. The cask lid seal and lifting lugs are protected by a wooden sacrificial impact limiter (about 8 x 10 inches thick). Gross weight of package and impact limiter is 50,000 lbs.

(3) Drawing

The packaging is constructed in accordance with PX Engineering Company, Inc., Drawing No. 589-L, Sheets 1 through 3, Revision No. 0.

Page 2 - Certificate No. 9139 - Revision No. 7 - Docket No. 71-9139

5. (b) Contents

(1) Type and form of material

Dewatered or solidified waste material in sealed secondary containers or solid irradiated hardware, meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 20,150 pounds.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 inflamable 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring must be placed between secondary containers (or activated components) and the cask cavity to prevent movement during normal conditions of transport.

8. The lid lifting lugs must not be used for lifting the cask and must be covered in transit.

CONDITIONS *(continued)*

Page 3 - Certificate No. 9139 - Revision No. 7 - Docket No. 71-9139

9. 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 the Operating Procedures in Tennessee Valley Authority supplement dated November 19, 1991; and

   (b) The packaging acceptance tests and maintenance program must be in accordance with Section 7.0 of the General Electric application, dated March 24, 1980, as supplemented, except:

      (i) The lid O-ring seal must be replaced if inspection prior to each shipment shows any defects or every twelve (12) months, whichever occurs first.

      (ii) During inactive periods, the maintenance and testing frequency may be disregarded provided that the packaging is brought into full compliance prior to the next use of the package.

10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned to sole use of the licensee.

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

12. Expiration Date: December 31, 1996.

REFERENCES

General Electric Application dated March 24, 1980.

General Electric supplements dated: May 29, and July 11, 1980.

Tennessee Valley Authority supplements dated: May 16, 1990; and November 19, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: DEC 6 1991

NRC FORM 618
(9-83)
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
9141	3	USA/9141/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 February 1, 1980.

c. DOCKET NUMBER 71-9141

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 900

(2) Description

A stainless steel encased, uranium shielded radiographic device. The shipping container is 13.0 inches long, 7.7 inches high and 5.3 inches wide. The radioactive source assembly is housed inside a tungsten source tube. The source tube is surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 44.0 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos. 90090, Sheets 1,2,3, and 4 of 4, Rev. 0; and 90091, Sheets 1 of 1, Rev. 0.

CONDITIONS *(continued)*

Page 2 - Certificate No. 9141 - Revision No. 3 - Docket No. 71-9141

5.(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.

7. The name plate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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 tests and Maintenance Program of Section 8.0 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: November 30, 1995

REFERENCES

Technical Operations, Inc. application dated February 1, 1980.

Amersham Corporation supplements dated April 30 and October 19, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 14 1990

NRC FORM 618
(9-83)
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
9143	3	USA/9143/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 August 1, 1980,

c. DOCKET NUMBER 71-9143

4. CONDITIONS

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

5. (a) Packaging

(1) Model No.: 920

(2) Description

A stainless steel encased, uranium shielded radiographic device. The shipping container is 13.0 inches long, 7.7 inches high and 5.3 inches wide. The radioactive source assembly is housed inside a tungsten source tube. The source tube is surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 47.0 pounds.

(3) Drawings

The packaging is constructed in accordance with the following Technical Operations, Inc. Drawing Nos. 92090, Sheets 1, 2, and 3 of 3, Rev. 0; 90090, Sheets 3, and 4 of 4, Rev. 0; and 90091, Sheet 1 of 1, Rev. A.

CONDITIONS *(continued)*

Page 2 - Certificate No. 9143 - Revision No. 3 - Docket No. 71-9143

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 curies

6. The source shall be secured in the shielded position of the packaging by the source assembly. The source assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly must engage the locking device. The source assembly must be of sufficient length and diameter to provide positive positioning of the source within the depleted uranium shield assembly.

7. The name plate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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 Tests and Maintenance Program of Section 8.0 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: January 31, 1996.

REFERENCES

Technical Operations, Inc. application dated August 1, 1980.

Amersham Corporation supplement dated November 12, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: DEC 19 1990

NRC FORM 618
(5-86)
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
9145	10	USA/9145/A	1	3

2. PREAMBLE

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

NUPAC Services, Inc.
No. 1 Harbison Way
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUPAC Services Division, Inc. application dated February 21, 1991, as supplemented.

c. DOCKET NUMBER 71-9145

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: NUPAC 50-1.5L, NUPAC 50-2.5L, NUPAC 50-3.0L, and NUPAC 50-4.0L.

(2) Description

A steel encased lead shielded cask for low specific activity material. The casks are right circular cylinder with a 48.5-inch inside diameter by 52.5-inch inside high cavity. The walls of the casks contain a lead thickness ranging from 1.25 to 3.75 inches encased in 3/8-inch thick steel shells. The bottom and top covers of the cask are made up of two, steel plates ranging in thickness from 1.00 to 3.00 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-inch rachet binders. A secondary cask lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The cask is provided with four equally spaced lifting/tie down devices. Cask gross weights range from 13,200 to 28,900 pounds.

(3) Drawing

The Model No. NUPAC 50 Series packagings are fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-201D, Sheets 1 and 2, Revision C.

Page 2 - Certificate No. 9145 - Revision No. 10 - Docket No. 71-9145

(b) Contents

(1) Type and form of material

(i) Dewatered, solid or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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/ft³ at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Shoring must be placed between secondary containers (or activated components) and the cask cavity to prevent movement during normal conditions of transport.

CONDITIONS *(continued)*

Page 3 - Certificate No. 9145 - Revision No. 10 - Docket No. 71-9145

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

   (a) Prior to each shipment, the packaging lid seals must be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first.

   (b) Each package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

   (c) The package shall be prepared for shipment and operated in accordance with the operating procedures in Section 7.0 of the application.

9. The package authorized by this certificate must be transported on a vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for sole use of the licensee.

10. Lid lifting devices must be covered prior to transport to prevent their use as tie-down devices.

11. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

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

13. Expiration date: March 31, 1996.

REFERENCES

NUPAC Services Division, Inc. application dated February 21, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: MAR 26 1992

NRC FORM 618
(6-86)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9147	5	USA/9147/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 October 30, 1980, as supplemented.

c. DOCKET NUMBER 71-9147

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No. 850

(2) Description

A stainless steel encased, uranium shielded source changer. The shipping container is 9.0 inches long, 10.8 inches high and 9.0 inches wide. The radioactive source assemblies are housed inside titanium source tubes. The source tubes are surrounded by depleted uranium metal for shielding. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the uranium shield assembly and stainless steel housing is filled with a castable rigid polyurethane foam. The gross weight of the container is 105.0 pounds.

(3) Drawings

The package is constructed in accordance with Technical Operations, Inc., Drawing No. 85090, Sheet 1 Rev. 0 (contained in supplement dated January 22, 1987), sheets 2 through 5, Rev. 0; Drawing No. 90091, Rev. A; Drawing No. 85000, Rev. D; Drawing Nos. 85000-5, 85000-6, 85000-7, Rev. -; and Drawing No. 91091, Rev. A.

(b) Contents

(1) Type and form of material

Iridium-192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 Curies.

Page 2 - Certificate No. 9147 - Revision No. 5 - Docket No. 71-9147

6. The sources must be secured in the shielded position of the packaging by the source assemblies. The source assemblies must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assemblies must engage the locking device. The source assemblies must be of sufficient length and diameter to provide positive positioning of the sources within the depleted uranium shield assembly. Shielded shipping plugs shall be installed on source tubes during transport.

7. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. 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 Section 8 in the application, as supplemented.

   (b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures of Section 7 in the application, as supplemented.

9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

10. Expiration date: November 30, 2000.

Technical Operations, the application dated October 30, 1980.

Amersham Corporation supplements dated: January 22, 1985; March 30, and November 3, 1988; March 10, 1989; October 19 and November 16, 1990; and August 15, 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 13 1995

NRC FORM 618
(9-86)
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
9148	4	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 charger 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 - Sheet 1, through 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

CONDITIONS *(continued)*

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, 1997.

REFERENCES

Technical Operations, Inc. application dated March 24, 1981.

Supplements dated: January 18, and May 10, 1982; February 25, and April 16, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JUN 23 1992

NRC FORM 618
(9-88)
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	4	USA/9150/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*)

U.S. Department of Energy
EH-32
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).

CONDITIONS *(continued)*

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, 1996.

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, and July 16, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: AUG 7 1991

NRC FORM 618
(6-85)
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
9151	15	USA/9151/A	1	4

2. PREAMBLE

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

Scientific Ecology Group, Inc.
1560 Bear Creek Road
Oak Ridge, TN 37831

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Scientific Ecology Group, Inc. application dated September 21, 1992.

c. DOCKET NUMBER 71-9151

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: HN-100 Series 3 and LN 14-170 Series I

(2) Description

Steel encased, lead shielded casks for low specific activity material. The casks are right circular cylinders 81-1/2 inches high by 81-3/4 inches in diameter. The cask cavities are 73-3/8 inches high by 75-1/2 inches in diameter. The cask side walls consist of a 3/8-inch thick inner steel shell, a 1-7/8-inch lead shell, and a 7/8-inch thick outer steel shell. The base is comprised of two, 2-inch thick steel plates welded together to form a 4-inch thick base which is integrally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is comprised of two, 2-inch thick steel plates, which are stepped and welded together to mate with the steel flange. The cask closure is sealed by a Neoprene gasket located between the lid and steel flange, positive closure of the lid is accomplished by eight, 1-3/4-inch ratchet binders. The lid contains a centrally located shield plug comprised of two, 2-inch thick steel plates and one, 1-inch thick steel plate stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nuts are used to provide positive closure. The packagings are constructed of A-516, Grade 70 or A-537, Class 1, carbon steel. The outer shell will have a minimum yield strength of 46,000 psi. Tie-down is accomplished by four tie-down lugs welded to the cask body. There are four cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 53,000 pounds.

(3) Drawings

The Model No. HN-100 Series 3 packaging is fabricated in accordance with Hittman Nuclear & Development Corp. Drawing Nos.: C001-5-9138, Rev. 13; C001-5-9139, Rev. 8; C001-5-9140, Rev. 9; C001-5-9141, Rev. 3; C001-5-9142, Rev. 1; C001-5-9143, Rev. 8; and C001-5-9144, Rev. 3. Optional stainless steel shielding insert in accordance with Drawing Nos.: STD-02-035, Rev. A; STD-02-036, Rev. A; and STD-02-037, Rev. 2.

The Model No. LN 14-170 Series I packaging is fabricated in accordance with LN Technologies Corporation Drawing Nos.: 8916 M 2001, Rev. 1; 8916 M 2002, Rev. 0; 8916 M 2003, Rev. 0; 8916 M 2004, Rev. 0; 8916 M 2005, Rev. 0; and 8916 M 2006, Rev. 0.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents, optional shield insert, and secondary containers shall not exceed 17,800 pounds. When the shield insert is not installed in the cask, the internal decay heat load shall not exceed 7 watts. When the shield insert is installed in the cask, the internal decay heat load shall not exceed 28 watts.

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

(a) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first.

(b) Each package must meet the Acceptance Tests and Maintenance Program of:

Model No. HN-100 Series 3

Section 7.0 of the application. Gamma scan for the shielding acceptance may be based on lead equivalence for lead and steel with all readings within 2.3 inches ± 10% on a 4-inch grid.

Model No. LN 14-170 Series I

LN Technologies Corporation Procedures WM-011, Rev. 1; WM-012, Rev. H; WM-013, Rev. F.

(c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of:

Model No. HN-100 Series 3

Section 8.0 of the application.

Model No. LN 14-170 Series I

LN Technologies Corporation Procedure WM-014, Rev. L.

8. Torque requirements for closure fasteners:

(a) Primary lid ratchet binders must be torqued to 175-200 ft-lbs.

(b) Secondary lid bolts must be torqued to 120 ± 10 ft-lbs.

9. Seals which show any visual defects (cracking, gouging, tearing, etc.) must be repaired in accordance with:

Model Nos. HN-100 Series 3

Note No. 3 on Hittman Drawing No. C001-5-9138, Rev. 13; or, replaced with a new seal.

Model No. LN 14-170 Series I

LN Technologies Corporation Procedure WM-012, Rev. H, Section 7.1 (joint angle must be approximately 45°); or, replaced with a new seal.

CONDITIONS *(continued)*

10. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

12. Expiration date: October 31, 1997.

REFERENCES

Scientific Ecology Group, Inc. application dated September 21, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: OCT 9 1992

NRC FORM 618
(8-89)
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	11	USA/9152/B( )F	1	4

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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
Transportation and Packaging
Safety Division, EH-33.2
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.

(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.

(3) Fissile Class III

Maximum number of packages per shipment for the contents described in 5(b)(1)(iii) One

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.

Page 3 - Certificate No. 9152 - Revision No. 11 - Docket No. 71-9152

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.

.1. 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, 1999.

REFERENCES

Department of Energy consolidated application dated: February 26, 1988.

Department of Energy supplements dated: May 12, 1989; and April 11. 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: MAY 13 1994

NRC FORM 618
(5-89)
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
9156	4	USA/9156/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)*

Industrial Nuclear Company
2515 Williams Street
San Leandro, CA 94577

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Industrial Nuclear Company application dated December 23, 1981, as supplemented.

c. DOCKET NUMBER 71-9156

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: IR-50

(2) Description

The Model No. IR-50 shipping container is designed for use as a source changer, storage container, and Type B shipping container for radiographic sources in special form. The Model No. IR-50 source changer measures 8.875 inches long, 4.5 inches wide, and 8.5 inches high. The radioactive source assembly is housed in Zircalloy or titanium "S" tube. The "S" tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the depleted uranium shield assembly and the inner container is filled with a rigid polyurethane foam. The 45 pound source changer is centered by plywood supports within a 10 gallon (min 20 gauge) steel drum with a 12-gauge steel closure ring. The gross weight of the source changer and overpack is 70 pounds.

(3) Drawings

The packaging is constructed in accordance with Industrial Nuclear Company Drawing Nos.: 2A, Rev. 1, dated November 4, 1992; 2B, Rev. 1, dated August 31, 1992; 50-4, Rev. 2, dated November 4, 1992; and 50-4(A), Rev. 2, dated August 31, 1992.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The sources must be secured in the shielded position of the packaging of the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The name plate on overpack must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility. The two vent holes in the side of the overpack must be covered with tape or rubber (plastic) plugs to prevent entry of rain water.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet the acceptance tests and maintenance program, and shall be operated and prepared for shipment in accordance with the operating procedures in the application document entitled "Operating Procedures, Acceptance Test, and Maintenance Program," Revision 1, dated November 4, 1992.

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

10. Expiration date: January 31, 1998.

REFERENCES

Industrial Nuclear Company application dated December 23, 1981.

Supplements dated: May 28, 1982; October 13, 1983; and March 20, June 25, September 4, and November 4, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: JAN 7 1993

NRC FORM 618
(8-95)
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	6	USA/9157/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)*

Industrial Nuclear Company
2515 Williams Street
San Leandro, CA 94577

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Industrial Nuclear Company Application
dated December 23, 1981, 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 exposure device is designed for use as an exposure device, storage container, and Type B shipping container for radiographic sources in special form. The Model No. IR-100 exposure device measures 8.875 inches long, 4.5 inches wide, and 8.5 inches high. The radioactive source assembly is housed in Zircalloy or titanium "S" tube. The "S" tube is surrounded by depleted uranium metal as shielding material. The depleted uranium shield assembly is encased in a stainless steel housing. The void space between the depleted uranium shield assembly and the inner container is filled with a rigid polyurethane foam. The gross weight of the exposure device is 53 pounds.

(3) Drawings

The packaging is constructed in accordance with Industrial Nuclear Company Drawing No. 1A, Rev. 2, dated November 4, 1992 and 1B, Rev. 1, dated June 15, 1992.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug, source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The name plate on the exposure device must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet the acceptance tests and maintenance program, and shall be operated and prepared for shipment in accordance with the operating procedures in the application document entitled "Operating Procedures, Acceptance Test, and Maintenance Program," Revision 1, dated November 4, 1992, as supplemented December 15, 1992.

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

10. Expiration date: January 31, 1998.

REFERENCES

Industrial Nuclear Company application dated December 23, 1981.

Supplements dated: May 28, 1982; October 13, 1983 (two letters); November 26, 1990; February 22, and April 26, 1991; and March 20, June 25, September 4, November 4, and December 15, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 7 1993

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
9159	6	USA/9159/A	1	4

2. PREAMBLE

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

Pacific Nuclear Systems, Inc.
Brookside Office Park
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUPAC application dated February 29, 1988, as supplemented.

c. DOCKET NUMBER 71-9159

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: NUPAC 14/190L, NUPAC 14/190M, NUPAC 14/190H, LN 14-170L, LN 14-170M, and LN 14-170H

(2) Description

Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 75.5-inch ID by 73.38-inch IH cavity. The walls of the casks contain a lead thickness ranging from 1.25 to 2.63 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch rachet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12-gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The casks gross weights range from 49,200 to 65,200 pounds.

Model Number	OD, inches	Lead Tk, inches	Top Tk, inches	Bottom Tk, inches	Gross Wt, pounds
NUPAC 14/190L, LN 14-170L	80.5	1.25	4.0	4.0	49,200
NUPAC 14/190M, LN 14-170M	81.5	1.75	4.0	4.0	53,500
NUPAC 14/190H, LN 14-170H	83.25	2.63	5.0	5.0	65,200

5. (a) (3) Drawings

Model Nos. NUPAC 14/190L, NUPAC 14/190M, and NUPAC 14/190H

The packages are fabricated in accordance with Nuclear Packaging, Inc. Drawing No. X-20-307-SNP, Sheets 1, 2 and 3, Revision No. A.

Model Nos. LN 14-170L, LN 14-170M, and LN 14-170H

The packages are fabricated in accordance with LN Technologies Corporation Drawing No. 5025-M-2005: Sheets 1 and 2, Revision No. 0.

(b) Contents

(1) Type and form of material

(i) Dewatered, solid, or solidified waste meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 7 watts for the Model Nos. NUPAC 14/190L, NUPAC 14/190M, LN 14-170L, and LN 14-170M; and 25 watts for the Model Nos. NUPAC 14/190H and LN 14-170H casks.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

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7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 20,000 pounds.

8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and the shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

10. The cask must be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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

    (a) Prior to each shipment, the packaging Neoprene lid seals if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, which ever occurs first. Cavity drain and vent lines must be sealed with appropriate sealant applied to the pipe plug threads.

    (b) Each packaging must meet the Acceptance Tests and Maintenance Program of:

    Model Nos. NUPAC 14/190L, NUPAC 14/190M and NUPAC 14/190H

    Section 8.0 of the application.

    Model Nos. LN 14-170L, LN 14-170M and LN 14-170H

    LN Technologies Corporation Procedures WM-036, Rev. A; WM-026, Rev. B; and WM-013, Rev. F.

    (c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of:

    Model Nos. NUPAC 14/190L, NUPAC 14/190M and NUPAC 14/190H

    Section 7.0 of the application.

    Model Nos. LN 14-170L, LN 14-170M and LN 14-170H

    LN Technologies Corporation Procedures WM-025, Rev. C.

12. The ratchet binders on the cask lid must be torqued to 100±10 ft-lb.

13. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

14. The packages authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

16. Expiration date: May 31, 1998.

REFERENCES

Nuclear Packaging, Inc., application dated February 29, 1988.

Supplements dated: April 19, 1988; and February 16, 1993.

NUS supplement dated: November 22, 1985.

LN Technologies Corporation supplement dated: February 16, 1988.

Scientific Ecology Group, Inc., supplement dated: April 30, 1993

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

NRC FORM 618
(6-83)
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	2	USA/9165/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 May 21, 1982, 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 Technical Operations Inc. Drawing No. 85590: Sheet No. 1, Rev. 1; Sheet No. 2, Rev. 0; Sheet No. 3, Rev. 2; and Sheet Nos. 4 and 5, Rev. 0.

(b) Contents

(1) Type and form of material

Iridium-192 sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

1,000 curies with no more than 240 curies in a single source.

CONDITIONS *(continued)*

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 dated August 16, 1993.

   (b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7 of the application dated August 16, 1993.

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, 1998.

REFERENCES

Technical Operations, Inc. application dated May 21, 1982.

Supplements dated: May 12 and November 10, 1983.

Amersham Corporation supplements dated: November 8, 1988; and August 16, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 15 1993

NRC FORM 618
(8-83)
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
9166	3	USA/9166/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 July 15, 1982, as supplemented.

c. DOCKET NUMBER 71-9166

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 864

(2) Description

The Model No. 864 shipping container is designed for use as a source changer, storage container, and Type B shipping container for radiographic sources in special form. The Model No. 864 source changer is 6.0 inches in diameter and 9.56 inches high. The package incorporates two handles which protrude from the side of the package (8.31 inches at its widest point). Three radioactive source assemblies are housed in brass source tubes. The source tubes are surrounded by uranium metal shielding (43 lbs). The uranium shield assembly is encased in a carbon steel housing with void space filled with a castable rigid polyurethane foam. A deck plate above the shield contains three source latching assemblies and a shipping cover protecting the latching assemblies during shipment. The gross weight of the container is 67 pounds.

(3) Drawing

The packaging is constructed in accordance with Technical Operations Inc. Drawing No. 86490, Sheets No. 1, through 6, Rev. 1; and 86491, Sheet No. 1, Rev. 1.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

360 curies

CONDITIONS *(continued)*

6. The source attached to the source assembly must be secured in the shielded position of the packaging by the source latching assembly with the latch bars in the engaged position. The safety pins shall be operational and the shipping cover shall be in place and secured.

7. The two (2), 1/4-inch diameter vent holes in the sides of the package shall be covered with tape or rubber (plastic) plugs to preclude the entry of rain water into the packaging.

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

   (b) The package must meet the Acceptance Test and Maintenance Program of Section 8.0 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: January 31, 1998.

REFERENCES

Technical Operations, Inc. application dated May 21, 1982.

Supplement dated: November 28, 1982.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 2 7 1993

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
9167	4	USA/9167/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)*

Amersham Corporation
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Amersham Corporation application dated August 25, 1982, as supplemented.

c. DOCKET NUMBER 71-9167

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: 3206B, 3227B, and 3218

(2) Description

The KEG containers are designed as Type B shipping containers for neutron sources in special form. The containers are constructed of stainless steel and the dimensions are 16.8 inches in diameter by 20.4 inches high. The containers are filled with water extended polyester (WEP) which provides radiation and thermal protection to the contents. The Model No. 3206B and 3227B containers each have one receptacle for the source (2-inch diameter and 3-inch diameter receptacles, respectively). The Model No. 3218 container has two (2) receptacles for the sources (2-inch diameter and 1.3-inch diameter receptacles). The smaller receptacle will be used only for a reference or calibration source. A stainless steel encased WEP plug will be inserted into the receptacle and held in place by a knurled stainless steel screw cap. A stainless steel latch bar is locked in place over the screw cap with a key operated padlock. The gross weight of each container is 165 pounds.

Page 2 - Certificate No. 9167 - Revision No. 4 - Docket No. 71-9167

5. (a) (3) Drawings

The packagings are constructed in accordance with Amersham Corporation Drawing Nos.:

Model No. 3206B	Model No. 3227B	Model No. 3218
0A22413, Rev. D	0A22527, Rev. D	0A22440, Rev. D
1A22299, Rev. G	1A22299, Rev. G	1A22299, Rev. G
3A22297, Rev. C	3A22297, Rev. C	2A22441, Rev. A
3A22420, Rev. B	3A22416, Rev. A	2A22442, Rev. A
2A22442, Rev. A	2A22528, Rev. A	3A22302, Rev. C
2A22385, Rev. B	2A22417, Rev. A	3A22439, Rev. A
2A22419, Rev. C		3A22443, Rev. A
		3A22444, Rev. A
		3A22321, Rev. C

and the "NOTES ON DRAWINGS" given on pp 1-34 and 1-35 of the application (01/17/83).

(b) Contents

(1) Type and form of material

Am-241/Be neutron sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

25 curies

6. Venting of the source receptacle(s) in event of decomposition of the WEP shielding plug due to the accident conditions of transport, shall be provided for by drilling a 1/4-inch hole in the top surface of the screw cap(s). The hole shall be filled with plastic, rubber, or low temperature melt alloy to preclude entry of rain water during normal conditions of transport.

7. Name plates on the container must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

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

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

(b) Each package shall be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program of Section 8 of the application, as supplemented.

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: December 31, 1998.

REFERENCES

Amersham Corporation application dated August 25, 1982.

Amersham Corporation supplements dated: January 17, 1983; March 1, 1988; August 1 and September 19, 1991; and February 17 and October 29, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 22 1993

NRC FORM 618
(5-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9168	8	USA/9168/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*)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Chem-Nuclear Systems, Inc. application dated February 26, 1990, as supplemented.

71-9168
c. DOCKET NUMBER

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 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.

Page 2 - Certificate No. 9168 - Revision No. 8 - Docket No. 71-9168

(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. H.

(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 flat washer torqued to 500 ft-lbs ± 50 ft-lbs (lubricated).

8. Prior to each shipment (except for the contents meeting the requirements for low specific activity material which is transported by exclusive use vehicle), the packaging must be leak tested in accordance with Section 8.2.2.2 of the application.

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, as supplemented February 22, 1994,

(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 Part 71.

12. Expiration date: June 30, 2000.

REFERENCES

Chem-Nuclear Systems, Inc., application dated February 26, 1990.

Supplement dated: February 22, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: June 23, 1995

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
9176	10	USA/9176/A	1	4

2. PREAMBLE

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

Pacific Nuclear Systems, Inc.
Brookside Office Park
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUPAC application dated February 29, 1988, as supplemented.

c. DOCKET NUMBER 71-9176

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: NUPAC 14/210L, NUPAC 14/210H, CNSI 14-215H Series A, LN 14-195L, and LN 14-195H

(2) Description

Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 77.25-inch ID by 80.25-inch IH cavity. The walls of the casks contain a lead thickness ranging from 1.25 to 1.88 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates with thickness of 2.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch rachet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12 gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line with pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The casks gross weights range from 51,600 to 58,400 pounds.

Model Number	OD, inches	Lead Tk, inches	Top Tk, inches	Bottom Tk, inches	Gross Wt, pounds
NUPAC 14/210L, LN 14-195L	82.25	1.25	4.0	4.0	51,600
NUPAC 14/210H, LN 14-195H	83.5	1.88	4.0	4.0	58,400
CNSI 14-215H Series A	83.8	1.85	4.0	4.0	58,400

5. (a) (3) Drawing

Model Nos. NUPAC 14/210L and NUPAC 14/210H

The packages are fabricated in accordance with Nuclear Packaging, Inc., Drawing No. X-20-306-SNP, Sheets 1, 2 and 3, Rev. A.

The packages may include an optional removable shield insert fabricated in accordance with Pacific Nuclear Drawing Nos. PS-121892-1 and PS-121892 submitted on December 21, 1992.

Model No. CNSI 14-215H Series A

The package is fabricated in accordance with Chem-Nuclear Systems, Inc., Drawing Nos. 24500-08, Sheets 1 and 2, Rev. D, and 24500-5, Rev. 2.

The package may include an optional removable shield insert fabricated in accordance with Chem-Nuclear Systems, Inc., Drawing No. C-119-B-0017, Rev. 2.

Model Nos. LN 14-195L and LN 14-195H

The packages are fabricated in accordance with LN Technologies Corporation Drawing No. 5025-M-2005, Sheets 1 and 2, Rev. 0.

(b) Contents

(1) Type and form of material

(i) Dewatered, solid, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 9 watts.

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%.

6. (a)(continued)

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

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, shoring, and optional shield insert is limited to 20,000 pounds.

8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and the shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

10. The cask must be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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

(a) Prior to each shipment, the packaging Neoprene lid seals if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, which ever occur first. Cavity drain and vent lines must be sealed with appropriate sealant applied to the pipe plug threads.

(b) Each packaging must meet the Acceptance Tests and Maintenance Program of:

Model Nos. NUPAC 14/210L and NUPAC 14/210H

Section 8.0 of the application.

Model No. CNSI 14-215H Series A

Chem-Nuclear Systems, Inc., Document No. CNSI 9176-S1, Rev. 1, Section 4.0.

Model Nos. LN 14-195L and LN 14-195H

LN Technologies Corporation Procedures WM-036, Rev. A; WM-026, Rev. B; and WM-013, Rev. F.

(c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of:

Model Nos. NUPAC 14/210L and NUPAC 14/210H

Section 7.0 of the application.

11. (c)(Continued)

Model No. CNSI 14-215H Series A

Chem-Nuclear Systems, Inc., Document No. CNSI 9176-S1, Rev. 1, Section 3.0.

Model Nos. LN 14-195L and LN 14-195H

LN Technologies Corporation Procedures WM-025, Rev. C.

12. The ratchet binders on the cask lid must be torqued to 100±10 ft-lb.

13. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

14. The packages authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

16. Expiration date: May 31, 1998.

REFERENCES

Nuclear Packaging, Inc., application dated February 29, 1988.

Supplements dated: April 19, 1988; and March 1, 1993.

Pacific Nuclear supplements dated: October 23 and December 2 and 21, 1992.

Chem-Nuclear Systems, Inc., supplements dated: February 19 and April 21, 1988; and January 18, and April 29, 1993.

NUS supplement dated: November 22, 1985.

LN Technologies Corporation supplement dated: February 16, 1988.

Scientific Ecology Group, Inc., supplement dated: April 30, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

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
9177	6	USA/9177/A	1	4

2. PREAMBLE

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

Pacific Nuclear Systems, Inc.
Brookside Office Park
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

NUPAC application dated February 29, 1988, as supplemented.

c. DOCKET NUMBER 71-9177

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: NUPAC 10/140 and LN 10-135A

(2) Description

Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 66.0-inch ID by 73.0-inch IH cavity. The walls of the casks contain a lead thickness of 2.75 inches encased in 0.50-inch thick inner steel shell and 1.13-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch rachet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12-gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. Each cask has a gross weight of 56,500 pounds.

5. (a)(3) Drawings

Model No. NUPAC 10/140

The package is fabricated in accordance with Nuclear Packaging, Inc., Drawing No. X-20-308-SNP, Sheets 1, 2, and 3, Rev. A.

Model No. LN 10-135A

The package is fabricated in accordance with LN Technologies Corporation Drawing No. 5025-M-2005: Sheets 1 and 2, Rev. 0.

(b) Contents

(1) Type and form of material

(i) Dewatered, solid, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain in fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The decay heat load is limited to 24 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 15,000 pounds.

8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and the shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

10. The cask must be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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

    (a) Prior to each shipment, the packaging Neoprene lid seals if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, which ever occurs first. Cavity drain and vent lines must be sealed with appropriate sealant applied to the pipe plug threads.

    (b) Each packaging must meet the Acceptance Tests and Maintenance Program of:

    Model No. NUPAC 10/140

    Section 8.0 of the application.

    Model No. LN 10-135A

    LN Technologies Corporation Procedures WM-036, Rev. A; WM-026, Rev. B; and WM-013, Rev. F.

    (c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of:

    Model No. NUPAC 10/140

    Section 7.0 of the application.

    Model No. LN 10-135A

    LN Technologies Corporation Procedures WM-025, Rev. C.

12. The ratchet binders on the cask lid must be torqued to 100±10 ft-lb.

13. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

14. The packages authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

16. Expiration date: May 31, 1998.

REFERENCES

Nuclear Packaging, Inc. application dated February 29, 1988.

Supplements dated: April 19, 1988; and February 16, 1993.

NUS supplement dated: November 22, 1985.

LN Technologies Corporation supplement dated: February 16, 1988.

Scientific Ecology Group, Inc., supplement dated: April 30, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

NRC FORM 618
(5-85)
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
9178	6	USA/9178/A	1	4

2. PREAMBLE

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

Pacific Nuclear Systems, Inc.
Brookside Office Park
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

NUPAC application dated February 29, 1988, as supplemented.

c. DOCKET NUMBER 71-9178

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: NUPAC 7/100 and LN-7-100

(2) Description

Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 75.5-inch ID by 40.75-inch IH cavity. The walls of the casks contain a lead thickness of 3.00 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.5 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch rachet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12-gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. Each cask has a gross weight of 48,900 pounds.

5. (b) Drawings

Model No. NUPAC 7/100

The package is fabricated in accordance with Nuclear Packaging, Inc., Drawing No. X-20-309-SNP, Sheets 1, 2, and 3, Revision No. A.

Model No. LN 7-100

The package is fabricated in accordance with LN Technologies Corporation Drawing No. 5025-M-2005, Sheets 1 and 2, Revision No. 0.

(c) Contents

(1) Type and form of material

(i) Dewatered, solid, or solidified wastes, meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits of 10 CFR §71.53. The decay heat load is limited to 17 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 13,000 pounds.

8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and the shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

10. The cask must be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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

(a) Prior to each shipment, the packaging Neoprene lid seals if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, which ever occurs first. Cavity drain and vent lines must be sealed with appropriate sealant applied to the pipe plug threads.

(b) Each packaging must meet the Acceptance Tests and Maintenance Program of:

Model No. NUPAC 7/100

Section 8.0 of the application.

Model No. LN 7-100

LN Technologies Corporation Procedures WM-036, Rev. A; WM-026, Rev. B; and WM-013, Rev. F.

(c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of:

Model No. NUPAC 7/100

Section 7.0 of the application.

Model No. LN 7-100

LN Technologies Corporation Procedures WM-025, Rev. C.

12. The ratchet binders on the cask lid must be torqued to 100±10 ft-lbs.

13. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

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14. The packages authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

16. Expiration date: May 31, 1998.

REFERENCES

Nuclear Packaging, Inc., application dated February 29, 1988.

Supplements dated: April 19, 1988; and February 16, 1993.

NUS supplement dated: November 22, 1985.

LN Technologies Corporation supplement dated: February 16, 1988.

Scientific Ecology Group, Inc., supplement dated: April 30, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

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
9179	6	USA/9179/A	1	4

2. PREAMBLE

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

Pacific Nuclear Systems, Inc.
Brookside Office Park
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUPAC application dated February 29, 1988, as supplemented.

c. DOCKET NUMBER 71-9179

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: NUPAC 6/100L, NUPAC 6/100H, LN 6-80L, and LN 6-80H

(2) Description

Steel encased lead shielded casks for low specific activity material. The casks are right circular cylinders with a 61.0-inch ID by 62.0-inch IH cavity. The walls of the casks contain a lead thickness ranging from 2.43 to 3.56 inches encased in 0.50-inch thick inner steel shell and 1.13-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates ranging in thickness from 2.0 to 3.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch rachet binders. An optional secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The casks may be provided with an optional 12-gauge stainless steel liner (seal welded along all edges), an optional lid vent line with pipe plug, and an optional 3/4-inch drain line and pipe plug. The casks are provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the optional secondary lid is provided with one lifting lug. The casks gross weights range from 42,900 to 53,900 pounds.

Model Number	OD, inches	Lead Tk, inches	Top Tk, inches	Bottom Tk, inches	Gross Wt, pounds
NUPAC 6/100L, LN 6-80L	69.11	2.43	4.5	4.5	42,900
NUPAC 6/100H, LN 6-80H	71.37	3.56	6.0	6.0	53,900

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5. (a) (3) Drawings

Model Nos. NUPAC 6/100L and NUPAC 6/100H

The packages are fabricated in accordance with Nuclear Packaging, Inc., Drawing No. X-20-310-SNP, Sheets 1 and 2, Revision No. A.

Model Nos. LN 6-80L and LN 6-80H

The packages are fabricated in accordance with LN Technologies Corporation Drawing No. 5025-M-2005, Sheets 1 and 2, Revision No. 0.

(b) Contents

(1) Type and form of material

(i) Dewatered, solid, or solidified wastes, meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits of 10 CFR §71.53. The decay heat load is limited to 9 watts for the Model Nos. NUPAC 6/100L and LN 6-80L casks and 61 watts for the Model Nos. NUPAC 6/100H and LN 6-80H casks.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, and shoring is limited to 15,000 pounds.

8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and the shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

10. The cask must be provided with either (or both) a drain line or a lid vent line as shown in the drawing in order to provide a method to leak test the package.

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

    (a) Prior to each shipment, the packaging Neoprene lid seals if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, which ever occurs first. Cavity drain and vent lines must be sealed with appropriate sealant applied to the pipe plug threads.

    (b) Each packaging must meet the Acceptance Tests and Maintenance Program of:

    Model Nos. NUPAC 6/100L and NUPAC 6/100H

    Section 8.0 of the application.

    Model Nos. LN 6-80L and 6-80H

    LN Technologies Corporation Procedures WM-036, Rev. A; WM-026, Rev. B; and WM-013, Rev. F.

    (c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of:

    Model Nos. NUPAC 6/100 and NUPAC 6/100H

    Section 7.0 of the application.

    Model Nos. LN 6-80L and LN 6-80H

    LN Technologies Corporation Procedures WM-025, Rev. C.

12. The ratchet binders on the cask lid must be torqued to 100±10 ft-lbs.

13. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

14. The packages authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

16. Expiration date: May 31, 1998.

REFERENCES

Nuclear Packaging, Inc., application dated February 29, 1988.

Supplements dated: April 19 and 26, 1988; and February 16, 1993.

NUS supplement dated: November 22, 1985.

Scientific Ecology Group, Inc., supplement dated: April 30, 1993.

LN Technologies Corporation supplement dated: February 16, 1988.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: MAY 20 1993

NRC FORM 618
(9-86)
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
9181	5	USA/9181/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Packaging, Inc. application dated dated March 31, 1983, as supplemented.

c. DOCKET NUMBER 71-9181

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: PAS-2 and PAS-2A

(2) Description

A post accident liquid sampling container, the packaging consists of an outer overpack, inner overpack, containment vessel or optional secondary containment vessel (Model No. PAS-2A), sample shield, and a sample vial. The outer overpack is 32" OD x 48" high constructed with an outer shell of low carbon steel and an inner shell of fiberglass. The annulus between the shells is filled with foam having a density of approximately three pounds per cubic foot. The inner overpack consists of a Department of Transportation Specification 17H steel drum lined with rigid polyrethane foam cut to fit the outside dimensions of the primary containment vessel. The optional secondary containment vessel is fabricated from carbon or stainless steel (17.7" OD x 24-3/4" high) provided with a Viton O-ring and eight, 5/16" cap screws. The primary containment vessel is equipped with a test port. The sample shield consists of a lead filled steel weldment (16.5" OD x 22.75" high) provided with four shielded wall penetrations and a shielded lid (all gasketed with Viton O-rings). The 3-3/4" ID x 8-1/4" high sample shield cavity contains a valved sample vial surrounded by absorbent vermiculite and lead shot. The vial, which serves as the secondary containment vessel, may contain about 50 milliliters of liquid (reactor coolant water sample). The gross weight of the package is approximately 2,400 pounds.

(3) Drawings

The packages are constructed in accordance with Nuclear Packaging, Inc. Drawing Nos.: X-20-220SNP, Sheets 1 through 4, Rev. C and X-107-500SP, Rev. A.

5. (b) Contents

(1) Type and form of material

Radioactive material in the form of liquid coolant sample obtained from a reactor coolant system.

(2) Maximum quantity of material per package

50 milliliters with a thermal heat load not to exceed 3.0 watts.

6. In addition to the requirements of Subpart G of 10 CFR Part 71, each package prior to first use must meet the acceptance tests and criteria specified in Section 8.1, must be maintained in accordance with Section 8.2, and prepared for shipment in accordance with Section 7.0 of the application. The sample shield and sample vial must be annually leak tested to the requirements of LT-12 (Appendix 8.3.2).

7. The statement of acceptance in NUPAC's test, Assembly Helium Shipper Test for the NUPAC PAS-2 Packaging (5.1, [illegible]-16, Rev. 2, March 9, [illegible]) must be replaced by the following acceptance criteria: For each assembly to have an acceptably low leakage rate, the detection equipment must be capable of detecting a leak of 10^{-4} scc/sec or smaller. Any detected leakage rate greater than the acceptance criteria prior to first use is not acceptable.

Prior to first use of each package, the leak tests specified as Notes 8 and 14 on Drawing No. X-20-220SNUP, Rev. [illegible], must be performed, as required.

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

10. Expiration date: August 31, 1995.

REFERENCES

Nuclear Packaging, Inc. application dated March 31, 1983.

Supplements dated: September 9, 1983; February 17, March 9, and December 19, 1984; April 9, 1985; June 2, 1986; February 11, 1987; February 27, and October 27, 1989; and May 31, 1990.

FOR THE U.S. NUCLEAR REGURLATORY COMMISSION

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

Date: AUG 14 1990

NRC FORM 618
(6-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9183	11	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*)

Nuclear Assurance Corporation
655 Engineering Drive
Suite 200
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation 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.

(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.

ˇge 2 - Certificate No. 9183 - Revision No. 11 - Docket No. 71-9183

5. (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 [illegible]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) [illegible] 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. [illegible], Rev. [illegible], 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. [illegible]211-[illegible]9, Rev. [illegible]

(ii) [illegible]600 MWD/MTU average burn-up.

(iii) Minimum 365-day cooling time after irradiation.

(c) Fissi˘e Class I

6. The cask cavity must be dry (no free water) when delivered to a carrier for transport.

7. As needed, appropriate component spacers (fuel basket and axial spacers for shipment of fuel rods) must be used in the cask cavity to limit movement of contents during accident conditions of transport.

8. The 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	Hydrotest 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 that 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, 1999.

REFERENCES

Nuclear Assurance Corporation application dated May 26, 1989.

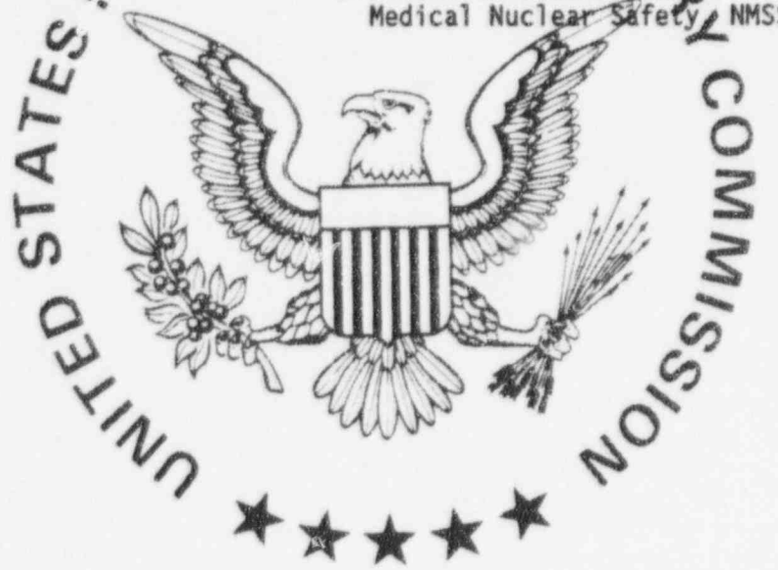
Supplements dated January 29 and March 20, 1990; and August 4, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: SEP 20 1994



NRC FORM 618
(6-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9184	3	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)

VECTRA Technologies, Inc.
One Harbison Way, Suite 209
Columbia, SC 29212

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 (43.0" 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, solidified 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 71.17.

8. Expiration date: July 31, 1999.

REFERENCES

Nuclear Packaging, Inc. consolidated application dated March 31, 1989.

Supplement dated: April 7, 1989.

VECTRA Technologies, Inc. supplement dated: July 8, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUL 27 1994

NRC FORM 618
(6-86)
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
9185	3	USA/9185/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)*

Industrial Nuclear Company
2515 Williams Street
San Leandro, CA 94577

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Industrial Nuclear Company application dated October 13, 1983.

c. DOCKET NUMBER

71-9185

4. CONDITIONS

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

5. (a) Packaging

(1) Model No.: OP-100

(2) Description

Protective overpack for Model No. IR-100 exposure device. The overpack consists of an outer container which is a 10-gallon open head steel drum having a minimum 20-gauge body and cover, welded seams and a 12-gauge clamp-ring type head closure. The 53 pound exposure device is centered by plywood supports within the drum. The gross weight of the exposure device and overpack is 78 pounds.

(3) Drawings

The overpack is constructed in accordance with Industrial Nuclear Company Drawing Nos.: 100-4, Rev. 2, dated November 4, 1992; and 100-4(A), Rev. 2, dated August 31, 1992.

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

120 curies

6. The sources must be contained within the Model No. IR-100 packaging in accordance with Certificate of Compliance No. 9157.

7. The name plate on the overpack must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility. The two vent holes in the side of the overpack must be covered with tape or rubber (plastic) plugs to prevent entry of rain water.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, each package must meet the acceptance tests and maintenance program, and shall be operated and prepared for shipment in accordance with the operating procedures in the application document entitled "Operating Procedures, Acceptance Test, and Maintenance Program," Revision 1, dated November 4, 1992, as supplemented December 15, 1992.

9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 571.12.

10. Expiration date: January 31, 1998.

REFERENCES

Industrial Nuclear Company application dated December 23, 1981.*

Supplements dated: May 28, 1982*; October 13, 1983 (two letters)*; April 26, 1991; and March 20, June 25, September 4, November 4, and December 15, 1992.

*See Docket No. 71-9157.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: JAN 7 1993

NRC FORM 618
(9-86)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9186	9	USA/9186/B(U)F	1	4

PREAMBLE

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

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.

The weight of the PUSC, including frame and contents is approximately 438,900 pounds for shipment of the S6W prototype power unit and 429,900 pounds for shipment of the S6W shipboard power unit.

5.(a) Continued

(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.

(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.

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.

(c) Fissile Class — III

Maximum number of packages per shipment — One (1)

6. The Model 1 S-6213 PUSC shall be designated as B( )F. Use of Model 1 S-6213 PUSC 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.

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.

*This requirement shall not be construed to require an inspection if the 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.

(c) If any indications, as defined in accordance with either:

(i) Paragraph UA-93(a), Appendix VIII, Division 1, Section VIII, ASME Code (with 7(b)(2)(i), above), or

(ii) Paragraphs UA-72 and UA-73, Appendix VI, Division 1, Section VIII, ASME Code (with 7(b)(2)(i), above), or

CONDITIONS *(continued)*

(iii) 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

(iv) NAVSHIPS 250-1500-1, Section 10.3.2 (with 7(b)(1)(iii) or 7(b)(2)(iii), above), as noted,

are detected, the packaging shall be repaired and reinspected prior to use and shall be inspected prior to each shipment thereafter. Any defects shall be reported in accordance with 10 CFR §71.95.

9. Expiration date: July 31, 1997

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.

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.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Date: APR 1 1993

NRC FORM 618
(8-89)
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	2	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*)

Amersham Corporation
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; 86591, Rev. 1; and 86500-10, Rev. 0.

Page 2 - Certificate No. 9187 - Revision No. 2 - Docket No. 71-9187

(b) Contents

(1) Type and form of material

Iridium-192 as sealed source must meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

240 curies.

6. 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 October 29, 1993, 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, 1998.

REFERENCES

Tech/Ops application dated December 27, 1983.

Supplements dated: March 15, 1984, November 8, 1988, and August 16, and October 29, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 15 1993

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
9196	6	USA/9196/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 Packaging, Inc.
1010 South 336th Street
Federal Way, WA 98003

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Packaging, Incorporated application dated November 22, 1989, as supplemented.

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 5-inch thick foam (8 - 9.5 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 Nuclear Packaging, Incorporated Drawing No. X-20-235D, Sheets 1 through 3, Rev. I.

(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. 30A cylinder: 4,950 pounds UF_6 enriched to not more than 5 w/o in the U-235 isotope.

(ii) Model No. 30B cylinder: 5,020 pounds UF_6 enriched to not more that 5 w/o in the U-235 isotope.

Page 2 - Certificate No. 9196 - Revision No. 6 - Docket No. 71-9196

(c) Fissile Class II

Minimum transport index to be shown on label for Class II 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 (1990 edition). Cylinders shipped after December 31, 1992 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. 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.

8. 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).

9. Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

10. The packaging shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 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.

12. Expiration date: January 31, 1995

REFERENCES

Nuclear Packaging, Incorporated applicati dated November 22, 1989.

Supplements dated: December 20, 1989, November 8, 1990, June 10, June 18, September 11, October 9, and November 6, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 13 1992

NRC FORM 618
(9-83)
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	8	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
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

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 (37,006 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) Fissile Class III

Maximum number of packages per shipment (vehicle) One

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 1×10^{-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. Expiration date: May 31, 1996.

CONDITIONS *(continued)*

Page 5 - Certificate No. 9200 - Revision No. 8 - Docket No. 71-9200

REFERENCES

Nuclear Packaging, Inc. application dated April 6, 1991.

Supplement dated: April 9 and 15, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: MAY 6 1991

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
9202	4	USA/9202/B(U)F	1	4

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

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-RRP

(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 219,000 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 a bottom plate and lid. The bottom plate and lid are made from 9.62-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.

page 2 - Certificate No. 9202 - Revision No. 4 - Docket No. 71-9202

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
3024-150-23, Rev. 2	Parts List
3024-150-[illegible], Rev. 2	Trunnion Shoulder Bolt
3024-150-[illegible], Rev. 0	Impact Limiter Spacers
3024-150-[illegible], 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

page 3 - Certificate No. 9202 - Revision No. 4 - Docket No. 71-9202

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 11 kilowatts. Maximum 303 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)(i).

(c) Fissile Class III

Maximum number of packages per shipment (vehicle) One

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.

7. 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, 1999.

REFERENCES

Transnuclear Inc. application dated January 19, 1989.
Supplements dated: March 22, 1989, December 19, 1990, March 4, October 3, 1991, April 21, 1994, and November 7, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 08 1994

NRC FORM 618
(9-89)
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	2	USA/9203/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)*

B&W Fuel Company
P.O. Box 11646
Lynchburg, VA 24506-1646

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

B&W Fuel Company application dated November 19, 1990, 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 flang closure and stainless steel welded bottom plate. The containment vessel is centered and supported in a 55-gallon DOT Specification 17C carbon steel drum by 16.5± 2 lbs/ft^3 industrial cane fiberboard.

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 outer 16-gauge lid is made with a 12-gauge bolt locking ring with drop forged lugs, one of which is threaded, having a 5/8-inch diameter bolt and lock nut.

The gross weight of the packaging and contents is 490 pounds.

(3) Drawing

The packaging is constructed in accordance with Babcock & Wilcox Company Drawing No. MS-215E, Rev. 3.

(b) Contents

(1) Type and form of material

Dry uranium oxide pellets enriched to a maximum 4.1 w/o in the U-235 isotope. The maximum H/U atomic ratio, considering all sources of hydrogenous material within the containment vessel must not exceed 1.3. Pellets must be packaged in accordance with Babcock & Wilcox Company Drawing No. MS-216E, Rev. 1.

(2) Maximum quantity of material per package

The total contents not to exceed 275 pounds, with the U-235 content not to exceed 4.1 kilograms.

(c) Fissile Class II and III

Corrugated Trays

Minimum transport index to be shown on label Class II 0.5

Maximum number of packages per shipment for Class III 150

Bagged Pellets

Minimum transport index to be shown on label for Class II 1.0

Maximum number of packages per shipment for Class III 50

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 of Chapter 7 of the application.

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

7. 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).

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, 1996.

REFERENCES

B&W Fuel Company application dated November 19, 1990.

Supplements dated: December 7 and December 10, 1990, and January 3 and January 11, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: JAN 2 3 1991

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
9204	0	USA/9204/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)*

Chem-Nuclear Systems, Incorporated
220 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Chem-Nuclear Systems, Incorporated, application dated June 16, 1986, as supplemented.

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 weight of contents, shoring, and secondary containers	18,000 lbs

The cask body consists of a 1-1/8-inch thick carbon steel (A-516) inner shell, a 1-7/8-inch thick lead gamma shield, and a 2-inch thick carbon steel outer shell. The inner and outer shells are welded to a 5-1/2-inch thick carbon steel bottom plate. The cask cavity has an optional 12-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.

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 a silicone O-ring seal.

The package is equipped with four tie-down lugs welded to the cask outer shell, and two lifting lugs which 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.

(3) Drawings

The packaging is constructed and assembled in accordance with the following Chem-Nuclear Systems, Incorporated, Drawings:

Drawing Number	Revision
C-110-D-29003-010	Rev. F
C-110-D-29003-011	Rev. F
C-110-D-29003-012	Rev. D
C-110-D-29003-013	Rev. B
C-110-A-29003-014	Rev. D
C-110-D-29003-020	Rev. D
C-110-D-29003-021	Rev. D

(b) Contents

(1) Type and form of material

(i) Byproduct 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. Weight of contents, secondary containers, and shoring not to exceed 18,000 pounds. Contents may include fissile materials provided the mass limits of 10 CFR §71.53 are not exceeded.

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 ports must be plugged and sealed prior to transport.

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, except for contents meeting the requirements of low specific activity material which is transported by exclusive use vehicle, the package must be leak tested in accordance with Section 8.2.2.2 of the application.

   (b) The packaging containment system must be leak tested in accordance with Section 8.1.2 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 wastes 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, 1995.

REFERENCES

Chem-Nuclear Systems, Inc., application dated June 16, 1986.

Supplements dated: August 27, 1986, April 22, 1988, June 28 and November 29, 1989, and April 17, June 6, September [illegible], 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. Macdonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 2 1990

NRC FORM 618
(5-86)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9206	3	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)

Office of Facility Safety
Analysis, EH-32
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 atached, 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 1-1/8 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, one-half of 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) (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/tiedown 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. 0	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
3024-150-34, Rev. 0	B_4C Poison Rod
3024-150-[illegible], 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	Zircalloy
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 17.7 kilowatts. Maximum 885 watts per PWR assembly.

(iii) Above fuel assemblies to be positioned in the fuel baskets as shown in the drawings referenced in 5.(b)(3)(ii).

(3) Fissile Class III

Maximum number of packages per shipment One

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 30 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 failed fuel assemblies (rods) and fuel with cladding defects greater than 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 §71.17.

11. Expiration Date: May 31, 2000.

REFERENCES

Transnuclear, Inc. application dated September 5, 1989.

Supplements dated: March 7 and October 22, 1990; January 7 and February 11, 1991; November 7, 1994; and March 2 and 15, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: 04/21/95

NRC FORM 618
(5-85)
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
9208	7	USA/9208/B( )	1	3

PREAMBLE

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

VECTRA Technologies, Inc.
One Harbison Way, Suite 209
Columbia, SC 29212

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NuPac Services, Inc., application dated April 17, 1991, as supplemented.

71-9208

c. DOCKET NUMBER

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 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 1/2-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) Drawing

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 package shall be leak tested in accordance with 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 package shall be leak tested in accordance with the supplement dated November 24, 1992.

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: June 30, 1996.

REFERENCES

Nuclear Packaging, Inc., application dated April 17, 1991.

Supplements dated: May 24, 1991; November 24, 1992; May 19, 1993; and January 20, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: MAY 24 1994

NRC FORM 618
(9-86)
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
9210	1	USA/9210/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*)

Scientific Ecology Group, Inc.
P.O. Box 2530
1560 Bear Creek Road
Oak Ridge, Tennessee 37831-2530

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 1/2-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.

Page 2 - Certificate No. 9210 - Revision No. 1 - Docket No. 71-9210

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

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 and 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 14,000 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:

(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) does not apply.

Page 3 - Certificate No. 9210 - Revision No. 1 - Docket No. 71-9210

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):

   1. prior to the first use of each package,
   2. after the package's third use,
   3. within twelve months of the last leak test, and
   4. whenever gaskets are replaced.

9. Prior to each shipment, except when only low specific activity material is transported as exclusive use, the containment system shall be tested to 5.0×10^{-3} atm-cm^3/sec (at the standards conditions of ANSI N14.5) to verify that it has been properly assembled.

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, 1999.

REFERENCES

Scientific Ecology Group, Inc., application dated October 26, 1993.

Supplements dated: April 5 and October 31, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: Dec. 21, 94

NRC FORM 618
(5-89)
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	4	USA/9215/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)*

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:

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:

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:

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, 1997.

REFERENCES

Neutron Products, Incorporated application dated September 14, 1992.

Supplements dated: October 29, 1992, and November 17, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: FEB 17 1994

NRC FORM 618
(6-88)
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
9216	3	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. A; C-110-B-06402-003, Rev. C; and C-110-B-06402-004, Rev. A.

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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.

(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) Fissile Class III

CONDITIONS *(continued)*

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Maximum number of packages per shipment	(i)	Contents 5.(b)(1)(i), 5.(b)(1)(ii),5.(b)(1)(iii), or 5.(b)(1)(vi): Two (2)

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.

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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 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, 1997.

REFERENCES

Chem-Nuclear Systems, Inc. application dated November 24, 1987.

Supplement dated: November 24, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

DEC 16 1992

Date: _____

NRC FORM 618
(8-89)
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	3	USA/9217/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
P.O. Box 130
Richland, WA 99352-0130

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Advanced Nuclear Fuels Corporation application dated October 12, 1987, as supplemented.

71-9217
c. DOCKET NUMBER

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: ANF-250

(2) Description

A uranium oxide powder/pellet shipping container. The packaging consists of a 16-gauge steel inner vessel, 11-1/2 inches ID by 57-1/4 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 gross weight of the packaging and contents is approximately 610 pounds.

(3) Drawings

(i) The packaging is constructed in accordance with Siemens Power Corporation Drawing No. EMF-306,175 R-9 (Revision No. 9), Sheets 1, 2, and 3.

(3) Drawings (cont'd)

(ii) The powder product container insert is constructed in accordance with Advanced Nuclear Fuels Corporation Drawing No. ANF-607,244, Sheet 1, Rev. 5, Sheet 2, Rev. 1, and Sheet 3, Rev. 2.

(iii) The container insert and pellet product suitcase, respectively, are constructed in accordance with Advanced Nuclear Fuels Corporation Drawing No. ANF-306,176, Rev. 1 and Siemens Nuclear Power Corporation Drawing No. EMF-304,306, Sheets 1 and 2, Rev. 4.

(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, and a maximum mass of 1149 g H considering all sources of hydrogenous material within the inner vessel.

(ii) Dry uranium oxide pellets enriched to a maximum 5.0 w/o in the U-235 isotope and a maximum mass of 1149 g H considering all sources of hydrogenous material within the inner vessel.

(iii) Uranium oxide pellets enriched to a maximum of 4 w/o in the U-235 isotope.

(iv) Uranium oxide powder enriched to a maximum of 4 w/o in the U-235 isotope, or

(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	2.2
3.8	55.1	2.1
4.6	41.6	2.0
5.0	36.9	1.9

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. 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).

(c) Fissile Class	I and II
(1) Minimum Transport Index to be shown on label for Fissile Class II	For contents described in 5(b)(1)(i) and limited in 5(b)(2)(i): 1.0 For contents described in 5(b)(1)(ii) and limited in 5(b)(2)(ii): 0.5
(2) Fissile Class I	For contents described in 5(b)(1)(iii) and limited in 5(b)(2)(iii), and for contents described in 5(b)(1)(iv) and limited in 5(b)(2)(iv)

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.

Expiration date: January 31, 2000.

REFERENCES

Advanced Nuclear Fuels Corporation application dated October 12, 1987.
Supplements dated: February 2, March 10, July 20, and December 7, 1989; and March 16, 1990.

Siemens Power Corporation application dated October 20, 1994.
Supplements dated: December 19, December 20, and December 30, 1994, and January 5 and January 10, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: 01/11/95

NRC FORM 618
(9-89)
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	6	USA/9218/B(U)F	1	4

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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
Transportation & Packaging
Safety Div., EH-33.3
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Packaging Inc. application
dated March 3, 1989, 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) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with Nuclear Packaging Inc. Drawing No. 2077-500 SNP, Sheets 1 through 11, Rev. K.

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.

(b) Contents

(1) Type and form of material

Dewatered, solid, or solidified transuranic and tritium-contaminated wastes. Wastes must be packaged in 55-gallon drums, standard waste boxes (SWB), or bins. Wastes must be restricted to prohibit explosives, corrosives, nonradioactive phrophorics and pressurized containers. Within a drum, bin or SWB, 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 drum, bin or SWB.

(2) Maximum quantity of material per package

Contents not to exceed 19,265 pounds, including shoring and secondary containers, with no more than 1,000 pounds per 55-gallon drum and 4,000 pounds per SWB.

Maximum number of containers per package and authorized packaging configurations are as follows:

(i) 14 55-gallon drums,
(ii) 2 SWBs,
(iii) 2 SWBs, each SWB containing one bin,
(iv) 2 SWBs, each SWB containing 4 55-gallon drums,
(v) 1 ten-drum overpack (TDOP), containing 10 55-gallon drums,
(vi) 1 TDOP, containing 1 SWB,
(vii) 1 TDOP, containing 1 bin within an SWB, or
(viii) 1 TDOP, containing 4 55-gallon drums within an SWB.

Fissile material not to exceed 325 grams Pu-239 equivalent with no more than 200 grams Pu-239 equivalent per 55-gallon drum or 325 grams Pu-239 equivalent per SWB. Pu-239 equivalent must be determined in accordance with Appendix 1.3.7 of the application.

Decay heat not to exceed the values given in Tables 6.1 through 6.3 "TRUPACT-II Content Codes", (TRUCON), DOE/WIPP 89-004, Rev. 8.

(c) Fissile Class I

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 drum, bin or SWB must be assigned to a shipping category in accordance with Table 5, "TRUPACT-II Content Codes", (TRUCON), DOE/WIPP 89-004, Rev. 8, or must be tested for gas generation and meet the acceptance criteria in accordance with Attachment 2.0, to Appendix 1.3.7 of the application.

8. Each drum, bin or SWB must be labeled to indicate its shipping category. All drums, bins or SWB's within a package must be of the same shipping category.

9. Each drum, bin, SWB, or TDOP must be equipped with filtered vents prior to shipment in accordance with Appendix 1.3.7 of the application. Drums which were not equipped with filtered vents during storage must be aspirated before shipment. The minimum aspiration time must be determined from Tables 7.1 through 9.3 in "TRUPACT-II Content Codes", (TRUCON), DOE/WIPP 89-004, Rev. 8.

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.

    (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.

11. The contents of each package must be in accordance with Appendix 7.4.3., "Payload Control Procedures", of the application.

12. Prior to each shipment, the lid and vent port seals on the inner and outer containment vessels must be leak tested to 1×10^{-7} std cm^3/sec in accordance with Chapter 7.0, "Operating Procedures", of the application.

13. All free standing water must be removed from the inner containment vessel cavity and the outer containment vessel cavity before shipment.

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: June 30, 1999.

REFERENCES

Safety Analysis Report for the TRUPACT-II Shipping Package dated March 3, 1989.

Supplements dated: May 26, June 27, June 30, August 3, and August 8, 1989; April 18, July 10, July 25, August 24, and December 20, 1990; April 11, April 29, and June 17 1991; September 24, 1992; April 22, and October 22, 1994.

"TRUPACT-II Content Codes", (TRUCON), DOE/WIPP 89-004, Rev. 8, dated October 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: March 30, 1995

NRC FORM 618
(9-83)
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	1	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, 42 and 43 dated March 11, 1968 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. A and Sheet 2 of 2, Rev. B and Westinghouse Electric Corporation Drawing No. 1755E01, Rev. A.

5. (b) Contents

(1) Type and form of material

Byproduct and special nuclear material in solid form, contained within the MIN-41 product container. The MIN-41 container is constructed in accordance with Westinghouse Electric Corporation, Drawing No. 2D77456.

(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 900 Btu/hr for an exclusive use shipment or 250 Btu/hr for a non-exclusive use shipment.

(c) Fissile Class I

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

(a) The MIN-41 container must be tested for leak tightness within one year prior to use to a minimum sensitivity of 10^{-7} atm-cm^3/sec.

(b) Prior to each shipment, the MIN-41 container must be leak tested after assembly to a minimum sensitivity of 10^{-3} atm-cm^3/sec.

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: January 31, 1996.

CONDITIONS *(continued)*

REFERENCES*

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

Supplements: Division of Naval Reactors letters S# 1458 dated June 19, 1968; S# 1570 dated September 19, 1968; S# 1597 dated September 19, 1968; S# 1658 dated October 22, 1968; S# 1681 dated November 7, 1968; S# 1690 dated November 22, 1968; S# 1903 dated March 19, 1969; S# 2000 dated June 2, 1969; S# 2509 dated June 10, 1970, and Bettis Atomic Power Laboratory letter WAPD-CL(IH)-733, dated October 10, 1968, and Division of Naval Reactors letters Z# 85-1605 dated April 1, 1985; S# 86-3305 dated February 3, 1986; and S# 86-3332 dated June 16, 1986, and Bettis Atomic Power Laboratory letter WAPD-D(RAS)-526 dated June 20, 1986; and Division of Naval Reactors letter S#87-2738 dated September 18, 1987; and Naval Reactors letter S#90-12,039 dated December 24, 1990.

* See Docket No. 71-5814

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: FEB 12 1991

NRC FORM 618
(5-85)
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
9222	3	USA/9222/A	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*)

Scientific Ecology Group, Inc.
1560 Bear Creek Road
Oak Ridge, TN 37831-2530

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Hittman Nuclear application dated December 14, 1987, as supplemented.

c. DOCKET NUMBER 71-9222

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 14-215

(2) Description

Steel encased lead shielded cask for low specific activity material. The cask is a right circular cylinder with a 77.25-inch ID by 80.25-inch IH cavity. The outside diameter of the cask is 83.5 inches with a 92.25-inch height. The walls of the cask contain a lead thickness of 1.88 inches encased in 0.38-inch thick inner steel shell and 0.88-inch thick outer steel shell. The top cover and cask bottom are made up of two steel plates with thickness of 2.0 inches. The primary cask lid is secured to the cylindrical cask body by eight, 1-1/4-inch rachet binders. A secondary lid is centered in the primary lid and is secured to the primary lid with eight, 3/4-inch studs and nuts. Each lid is provided with a Neoprene gasket seal. The cask is provided with a 12-gauge stainless steel liner (seal welded along all edges), a lid vent line with pipe plug, and a 3/4-inch drain line and pipe plug. The cask is provided with four equally spaced lifting/tie-down devices. The primary lid is provided with three lifting lugs and the secondary lid is provided with one lifting lug. The cask gross weight is 58,400 pounds.

(3) Drawings

The package is fabricated in accordance with Scientific Ecology Group, Inc. Drawing No. STD-02-077, Sheets 1 and 2, Rev. 10.

The optional shield inserts are fabricated in accordance with Scientific Ecology Group, Inc. Drawing No. STD-02-086, Rev. 0.

5. b) Contents

(1) Type and form of material

(i) Dewatered, solids, or solidified waste, meeting the requirements for low specific activity material, in secondary containers; or

(ii) Activated solid components meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided that the fissile material does not exceed the limits in 10 CFR §71.18 and §71.22. The decay heat load is limited to 9 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Maximum gross weight of the contents, secondary containers, shield inserts and shoring is limited to 20,000 pounds.

8. Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to minimize movement during normal conditions of transport.

9. The lid and shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

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

    (a) Prior to each shipment, the packaging Neoprene lid seals must be inspected. The seals must be replaced within twelve (12) months prior to shipment. Also, seals must be replaced with new seals if inspection shows any defects. Cavity drain and vent lines must be sealed with appropriate sealant applied to the pipe plug threads.

    (b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application and Scientific Ecology Group, Inc. supplement dated May 16, 1990.

    (c) Each cask must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask must be leak tested within twelve (12) months prior to shipment and each seal must be leak tested after replacement in accordance with Paragraph 8.1.3 of the application.

11. The cask body and each lid must be marked in accordance with 10 CFR §71.85(c).

12. The packages authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

13. Optional shield inserts may be used as needed. The optional shield inserts must be fabricated in accordance with Scientific Ecology Group, Inc., Drawing No. STD-02-086, Revision 0.

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

15. Expiration date: March 31, 1999.

REFERENCES

Hittman Nuclear application dated December 14, 1987.

Hittman Nuclear supplements dated: January 26, March 25, and June 10, 1988.

Scientific Ecology Group, Inc. supplements dated: April 3 and May 16, 1990; January 26, June 10, and October 4, 1993; and February 3, February 25, and March 2, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: MAR 23 1994

NRC FORM 618
(8-95)
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
9224	2	USA/9224/A	1	3

2. PREAMBLE

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

Scientific Ecology Group, Inc.
P.O. Box 2530
1560 Bear Creek Road
Oak Ridge, TN 37831-2530

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Scientific Ecology Group, Inc.
application dated May 18, 1993.

c. DOCKET NUMBER 71-9224

4. CONDITIONS

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

5.

(a) Packaging

(1) Model Nos.: HN-190-2

(2) Description

Steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 81-1/2 inches high by 81-3/4 inches in diameter. The cask cavity is 73-3/8 inches high by 75-1/2 inches in diameter. The cask side walls consist of a 3/8-inch thick inner steel shell, a 1-3/4-inch lead shell, and a 7/8-inch thick outer steel shell. Each base is comprised of two, 2-inch thick steel plates welded together to form a 4-inch thick base which is integrally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is comprised of two, 2-inch thick steel plates which are stepped and welded together to mate with the steel flange. The cask closures are sealed by a Neoprene gasket located between the lid and steel flange, positive closure of the lid is accomplished by eight rachet binders. The lid contains a centrally located shield plug comprised of two, 2-inch thick steel plates and one, 1-inch thick steel plate stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nuts are used to provide positive closure.
Tie-down is accomplished by four tie-down lugs welded to the cask body. There are four cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 48,000 pounds.

5. (a) (3) Drawing

The Model No. HN-190-2 packaging is fabricated in accordance with Hittman Nuclear & Development Corp. Drawing Nos.: STD-02-080, STD-02-081, and STD-02-082, all Rev. O.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents and secondary containers shall not exceed 14,200 pounds and the internal decay heat load shall not exceed 7 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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 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.

Except for close fitting contents, shoring must be placed between secondary containers and the cask cavity to prevent movement during normal conditions of transport.

8. The lid and the shield plug lifting lugs must not be used for lifting the cask, and must be covered in transit.

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

   (a) Prior to each shipment, the packaging lid seals if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every twelve (12) months, which ever occur first. Cavity drain line and optional vent/test connection must be sealed with appropriate sealant applied to the pipe plug threads.

   (b) Each packaging must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application. In addition, the cask must be leak tested at least once every twelve (12) months in accordance with Subsection 8.1.3 of the application.

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

10. The cask body and each cask lid must be marked in accordance with 10 CFR §71.85(c).

11. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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

13. Expiration date: June 30, 1998.

REFERENCES

Scientific Ecology Group, Inc., application dated May 18, 1993.

Supplement dated: June 23, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JUL 09 1993

NRC FORM 618
(5-86)
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
9225	8	USA/9225/B(U)F	1	6

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 March 24, 1995, as supplemented.

c. DOCKET NUMBER 71-9225

4. CONDITIONS

This certificate 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

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, or up to 25 individual PWR 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 3/4-inch thick stainless steel inner shell, a 5-3/4 inch thick lead gamma shield, a 1-1/5 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, 20-3/4 inch diameter lead disk enclosed by a 3-1/2 inch thick stainless steel plate and bottom end forging. The cask lid is 11.3-inch thick stainless steel stepped design, secured to a 14-1/4 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. 2	Cask Assembly
LWT 315-40-02, Rev. 4	Body Assembly
* LWT 315-40-03, Rev. 9, (Sheets 1 - 6)	Transport Cask Body
LWT 315-40-04, Rev. 5	Cask Lid Assembly
LWT 315-40-06, Rev. 4	Upper Impact Limiter
LWT 315-40-07, Rev. 4	Lower Impact Limiter
LWT 315-40-08, Rev. 4, (Sheets 1 - 2)	Cask Parts Detail

* Packaging Units 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 Drawings:

LWT 315-40-09, Rev. 2	PWR Basket Spacer
LWT 315-40-10, Rev. 2	PWR Basket
LWT 315-40-11, Rev. 1	BWR Basket Assembly
LWT 315-40-12, Rev. 3	Metal Fuel Basket Assembly
LWT 315-40-045, Rev. 1	42 MTR Element Base Module
LWT 315-40-046, Rev. 1	42 MTR Element Intermediate Module
LWT 315-40-047, Rev. 1	42 MTR Element Top Module
LWT 315-40-048, Rev. 0	42 MTR Element Cask Assembly
LWT 315-40-049, Rev. 1	28 MTR Element Base Module
LWT 315-40-050, Rev. 1	28 MTR Element Intermediate Module
LWT 315-40-051, Rev. 1	28 MTR Element Top Module
LWT 315-40-052, Rev. 0	28 MTR Element Cask Assembly

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5. (b) Contents

(1) Type and form of material

(i) Irradiated PWR or BWR uranium oxide fuel assemblies, MTR fuel assemblies, or individual PWR rods of the following specifications:

	PWR	BWR	MTR	PWR Rods
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets	Cladded Plates	Clad UO_2 pellets
Nominal pellet diameter, in.	0.3659	0.487	0.021 (active fuel thickness)	0.3659
Cladding material	Zircalloy-4	Zircalloy-4	Aluminum	Zircalloy-4
Nominal cladding thickness, in.	0.0242	0.032	0.0145	0.0242
Maximum fuel rod length, in.	162	172	42.64	160
Assembly array	15 x 15	7 x 7	Parallel Plates	25 Rods (max.)
Maximum assembly weight, lbs	1,650	700	18.0	n/a
Maximum initial fuel pin pressure at 70°F, psig	565	565	n/a	565
Initial U^{235} enrichment, w/o	3.7 (max.)	4.0 (max.)	80-94	5.0 (max.)
Maximum initial U content/assembly, kg	475	186	0.377	58.2
Maximum average burnup, MWD/MTU	35,000	30,000	550,000*	60,000**
Minimum cooling time	2 yr.	2 yr.	3 yr.*	150 days

* The maximum burnup for NISTR is 642,000 MWD/MTU, with a minimum cool time of 3.5 years.

** Up to two of the 25 PWR rods may have a maximum burnup of 65,000 MWD/MTU

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5. (b) (1) (continued)

(ii) 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) (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 or two BWR assemblies positioned within the respective fuel assembly basket. Maximum decay heat not to exceed 2.5 kilowatts per PWR assembly or 1.1 kilowatts per BWR assembly.

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

(iii) For failed metallic fuel rods of the type described in Item 5.(b)(1)(ii):

(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-D4, 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. Plutonium content of the filters not to exceed 20 curies plutonium per package.

(iv) For MTR fuel assemblies as described in Item 5.(b)(1)(i): up to 42 fuel assemblies positioned within an MTR fuel assembly basket. For NISTR fuel the 42 fuel assemblies may be cut in half, producing 84 fuel bearing sections. Maximum decay heat not to exceed 1.26 kilowatts per package and 30 watts per fuel assembly.

5. (b) (2) (continued)

(v) For PWR rods as described in Item 5.(b)(1)(i): 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.

(c) Fissile Class

(1) For Metallic Fuel Rods, MTR fuel assemblies, and up to 25 PWR Rods: I

(2) For BWR and PWR assemblies: III

Maximum number of packages in Fissile Class III shipment: One

6. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized, except as described in Item 5.(b)(2)(vii).

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 inch-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. 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.

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; 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, except that replaced seals must be leak tested to 5.5×10^{-7} std cm^3/sec. 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, or MTR assemblies, or individual PWR 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 or individual PWR 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 package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

15. Expiration Date: February 28, 2000.

REFERENCES

NAC International, Inc., application dated March 24, 1995.

Supplements dated: May 12, June 14 and 15, and August 10 and 24, 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
(9-83)
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
9228	8	USA/9228/B(U)F	1	5

PREAMBLE

a. This certificate is issued to certify that the packaging 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
Vallecitos Nuclear Center
P.O. Box 460, Vallecitos Road
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated May 19, 1988, as supplemented.

c. DOCKET NUMBER 71-9228

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 2000

(2) Description

A steel encased lead shielded shipping cask. The cask is within a double-walled overpack with toroidal shell impact limiters at each end. The overall dimensions are approximately 131.5 inches in height and 72.0 inches in diameter. The cask is transported in the upright position. The gross weight of the package is approximately 33,550 lbs.

The cask is constructed of two concentric 1-inch thick 304 stainless steel cylindrical shells (ASTM A 240) joined at the bottom end to a 6-inch thick 304 stainless steel forging (ASTM A 182). The annulus between the two shells is filled with lead approximately 4 inches thick. The cask is approximately 71.0 inches in height and has an outer diameter of 38.5 inches. The cask cavity is approximately 26.5 inches in diameter and 54.0 inches deep.

The cask lid is 304 stainless steel and lead, has a stepped design, and is fully recessed into the cask top flange. The lid is secured to the cask body by 15, 1.25-inch diameter socket head screws. The cask is sealed by elastomeric O-rings bonded to a thin aluminum disc-shaped ring. The cask is equipped with a seal test port on the side of the cask body, a vent port in the cask lid, and a drain port near the bottom of the cask.

The cask is positioned within an overpack constructed from two 0.5-inch thick concentric 304 stainless steel cylindrical shells (ASTM A 240). The shells are separated radially by eight equally spaced tubes and horizontally by two tube sections. A 304 stainless steel toroidal shell impact limiter is attached to each end of the overpack. The overpack opens just above the lower impact limiter for access to the cask. The top of the overpack is joined to the base by 15, 1-3/8-inch diameter shoulder screws.

5(a)(2) Description (Continued)

Gussets on the top and bottom impact limiters provide tie-down points for the package. The cask body is equipped with attachment plates for lifting devices. The cask lifting devices are detached during transport.

(3) Drawings

(i) The packaging is constructed and assembled in accordance with General Electric Company Drawing Nos. 129D4946, Rev. 8; 105E9520, Rev. 3; and 105E9521, Rev. 2.

(ii) Packaging Serial No. 2004 is constructed and assembled in accordance with General Electric Company Drawing Nos. 129D4946, Rev. 8; 101E8718, Rev. 11; and 101E8719, Rev. 8.

(iii) The HFIR fuel basket and liner are constructed and assembled in accordance with General Electric Company Drawing No. 105E9523, Rev. 2.

(iv) The multifunctional rack is constructed and assembled in accordance with General Electric Company Drawing No. 105E9555, Rev. 2.

(v) The barrel rack is constructed and assembled in accordance with General Electric Company Drawing No. 166D8066, Rev. 1.

(vi) The material basket is constructed in accordance with General Electric Company Drawing No. 183C8356, Rev. 1. The material basket may be used with the multifunctional rack and the barrel rack.

(b) Contents

(1) Type and form of material

(i) Irradiated fuel rods, which may be cut or segmented.

(ii) Byproduct, source, and special nuclear material in solid form.

(iii) Irradiated High Flux Isotope Reactor (HFIR) fuel assembly, positioned within the HFIR fuel basket and liner as specified in 5(a)(3). The HFIR fuel assembly is fabricated in accordance with Oak Ridge National Laboratory Drawing Nos. M-11524-OH-101-D, Rev. 0, and M-11524-OH-102-D, Rev. 0.

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5.(b) Contents (Continued)

(2) Maximum quantity of material per package

Not to exceed 5,450 lbs, including carrier racks, shoring, secondary containers and shielding liner.

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

600 watts decay heat; and

Fissile contents not to exceed 1175 grams U-235 equivalent mass with initial enrichment not to exceed 5 weight percent in the fissile isotope; minimum pellet diameter of 0.3 inch, maximum burnup of 45 GWd/MTU, and minimum cooling time of 120 days; or

Fissile contents not to exceed 1750 grams U-235 equivalent mass with initial enrichment not to exceed 5 weight percent in the fissile isotope; minimum pellet diameter of 0.35 inch, maximum burnup of 38 GWd/MTU, and minimum cooling time of 120 days. Fuel rods must be contained in closed, 5-inch schedule 40 pipe, with a maximum of 4375 grams U-235 equivalent per pipe.

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

2000 watts decay heat; fissile contents not to exceed 500 grams U-235 equivalent mass. Carrier racks specified in 5(a)(3)(iv) or 5(a)(3)(v) must be used for contents exceeding 600 watts decay heat per package.

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

One HFIR fuel assembly. The fuel assembly is composed of one inner fuel element, with up to 2628 grams U-235, and one outer fuel element with up to 6872 grams U-235. The maximum uranium enrichment is 93.2 weight percent U-235. The maximum burnup per assembly is 2300 MWd, the minimum cool time is two years. Decay heat not to exceed 600 watts per package.

(c) Fissile Class III

Maximum number of packages per shipment One

6. Plutonium in excess of twenty curies per package must be in the form of metal, metal alloy or reactor fuel elements.

7. The U-235 equivalent mass is determined by U-235 mass plus 1.66 times U-233 mass plus 1.66 times Pu mass.

8. Bolt torque:

The cask lid bolts must be torqued to 690 ft-lbs (lubricated).

The bolts used to secure the top of the overpack to the overpack base must be torqued to 100 ft-lbs (dry).

9. (a) For any package containing organic or inorganic 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.

10. Prior to each shipment (except for material meeting the requirements of special form radioactive material), the package must be leak tested to 1 x 10^{-3} std cm^3/sec. Prior to first use, after the third use, and at least once within the 12-month period prior to each subsequent use, the package must be leak tested to 1 x 10^{-7} std cm^3/sec.

11. The cask must be vacuum dried prior to shipment if contents are loaded under water, or if water is introduced in the cask cavity. During shipments for which vacuum drying is performed, the cask cavity must be filled with helium.

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

(a) Prior to each shipment the cask seal must be inspected. The seal must be replaced with a new seal 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 Chapter 8 of the application, except that inspections in Section 8.2 of the application must be performed at least once within the 12-month period prior to each use; and

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

13. Appropriate carrier racks or shoring must be provided to minimize movement of contents during accident conditions of transport. A lead liner, as shown in General Electric Company Drawing No. 129D4922, Rev. -, which was included in the March 29, 1989 supplement, may be used inside the cask.

14. Each batch of ethylene propylene seals must be tested in accordance with Section 8.1.4.2 of the application.

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: June 30, 1999.

REFERENCES

General Electric Company application dated May 19, 1988.

Supplements dated: March 29 and August 24, 1989; May 30, October 11, and December 12, 1990; May 22, 1991; June 8, July 27, August 4, and December 9, 1993; April 29, and July 28, 1994; and May 19 and 30, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Edward Chappell

Edward Chappell, Section Leader
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: SEP 15 1995

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
9233	2	USA/9233/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)

Transnuclear, Inc.
Two Skyline Drive
Hawthorne, NY 10532-2120

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Transnuclear, Inc. application
dated November 22, 1988, as supplemented.

c. DOCKET NUMBER 71-9233

4. CONDITIONS

This certificate 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-RAM

(2) Description

The package is a steel encased lead shielded cask with wood impact limiters attached at both ends. The cask is a right circular cylinder. The overall dimensions of the packaging are approximately 178 inches long and 93 inches diameter with the impact limiters installed. The cask body is approximately 123 inches long with an outer diameter of 51 inches. The cask cavity has a length of approximately 111 inches and an inside diameter of 35 inches. The cask body is made of a 0.75-inch stainless steel inner shell, a 5.88-inch thick lead annulus, a 1.5-inch thick stainless steel outer shell, a 0.5-inch thick inner bottom plate and a 2.5-inch thick outside bottom plate. The lead shielding is 6 inches thick in the bottom end of the cask. The outer shell of the cask body is covered with a stainless steel thermal shield. The closure lid consists of a 2.5-inch thick outer stainless steel plate and a 0.5-inch thick inner stainless steel plate separated by 6 inches of lead shielding. The lid is secured by sixteen 1.5-inch diameter closure bolts. Two concentric silicone O-rings are installed in grooves on the underside of the lid. The cask is equipped with a sealed leak test port between the O-rings, a vent port in the closure lid and a sealed drain port in the bottom of the cask.

Each impact limiter is attached to the cask by eight 1.75-inch diameter bolts. The cask is equipped with 6 trunnions, four at the top and two at the bottom.

The gross weight of the package is approximately 80,000 pounds, including maximum contents of 9,500 pounds.

(3) Drawings

The packaging is constructed in accordance with Transnuclear, Inc. Drawing Nos. 990-701, Rev. 5; 990-702, Rev. 6; 990-703, Rev. 6; 990-704, Rev. 3; 990-705, Rev. 4; 990-706, Rev. 3; 990-707, Rev. 2; 990-708, Rev. 4; 990-709, Rev. 1.

(b) Contents

(1) Type and Form of Material

Dry irradiated and contaminated non-fuel-bearing solid materials contained within a secondary container.

(2) Maximum quantity of material per package

Greater than Type A quantities of radioactive material which may include fissile material provided that the fissile material does not exceed the generally licensed mass limits specified in 10 CFR 71.18, 71.20 and 71.22. The contents may not exceed 2,000 times an A$_2$ quantity. The decay heat of the contents may not exceed 300 watts. The maximum gross weight of the contents, secondary container and shoring is limited to 9,500 pounds.

5. As appropriate, shoring must be used in the secondary container sufficient to prevent significant movement of the contents under accident conditions.

7. Both the inner cask cavity and the secondary container must be free of water when the package is delivered to a carrier for transport.

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

(a) Prior to each shipment, the O-ring 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) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application.

(c) The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

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

10. Expiration date: January 31, 2000

REFERENCES

Transnuclear, Inc. application dated November 22, 1988.

Supplements dated: January 13, May 18, June 5, July 21, July 28, and August 11, 1989, and January 4, 1990.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: JAN 26 1995

NRC FORM 618
(9-83)
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
9234	5	USA/9234/B(U)F	1	3

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 Containers, Inc.
P.O. Box 1080
Elizabethton, TN 37643

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Containers, Inc. application dated January 11, 1993, as supplemented.

c. DOCKET NUMBER 71-9234

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: NCI-21PF-1

(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 fire resistant, phenolic-foam per USAEC Specification SP-9, Rev. 1, and Supplement K/TL-729. The volume between the 1/4-inch thick end closure plates of the two shells is filled with oak wood blocks which are cross-laminations of 3 layers of boards glued and nailed together. 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, 1-inch stainless steel toggle closures. The overpack is 43-5/8 inches O.D. by 92 inches long. Maximum gross weight of the package is 8,700 pounds.

(3) Drawing

The Model No. NCI-21PF-1 packaging is fabricated in accordance with Nuclear Containers, Inc. Drawing No. DED-206-B, Sheets 1 through 11, Rev. 5.

(b) Contents

(1) Type and form of material

Uranium hexafluoride, which may be recycled uranium hexafluoride, contained within a Model 30B cylinder.

(2) Maximum quantity of material per package

5,020 pounds uranium hexafluoride. Uranium enriched to not more than 5 w/o in the U-235 isotope. The total quantity of radioactive material within a package may not exceed 1150 times a Type A quantity.

(c) Fissile Class II

Minimum transport index 5.0

6. For recycled uranium hexafluoride, the fission product and activation product contamination must be limited as follows:

   (a) Combined alpha activity from plutonium and neptunium shall not exceed 3.3 Bq (89 pCi) per gram of uranium,

   (b) The concentration of Tc-99 shall not exceed 5 micrograms per gram of uranium,

   (c) The concentration of U-236 shall not exceed 1.17×10^{-3} microgram per gram of uranium,

   (d) Gamma radiation from fission products shall not exceed 4.4×10^{5} MeV/s per kilogram of uranium,

   (e) The concentration of U-232 shall not exceed 0.08 microgram per gram of uranium,

   (f) The concentration of U-237 shall not exceed 0.2000 micrograms per gram of uranium, and

   (g) The concentration of U-234 shall not exceed 0.025 gram per gram of uranium.

7. The Model 30B cylinders must be fabricated, inspected, tested, and maintained in accordance with American National Standard N14.1 (1990 Edition). 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.

8. At least once every five years, each packaging must be inspected to verify the presence and condition of the insulation. The inspection shall consist of inserting a probe through each vent hole in both the lid and base to confirm the presence and rigidity of the insulation. For packagings which require drying, the inspection must be performed after drying.

9. 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.

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

   (d) The loaded cylinder must be shipped without a valve protector. The valve protector must be replaced in accordance with normal handling practice when the cylinder is removed from the overpack.

10. For packages of recycled uranium hexafluoride containing a Type B quantity of radioactive material:

    (a) The Model 30B cylinder must be leak tested to 4×10^{-8} atm-cm^3/s helium leak rate within the 12 month period prior to transport, in accordance with Chapter 7 of the application, and

    (b) Prior to each shipment, after loading, the Model 30B cylinder and valve must show no leakage when tested to a sensitivity of at least 1×10^{-3} atm-cm^3/s air leak rate, in accordance with Chapter 7 of the application.

11. Packagings manufactured by Nuclear Containers, Incorporated, during the period November 30, 1991, to October 31, 1994, and bearing NCI serial Nos. 487 through 619, but excluding 487A and 488A, are authorized for use until October 31, 1995.

12. 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.

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

14. Expiration date: December 31, 1998.

REFERENCES

Nuclear Containers, Inc. application dated January 11, 1993.

Supplements dated: September 13, 1993; January 31, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cary R. Chappell

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

Date: NOV 15 1994

NRC FORM 618
(9-89)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

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

2. PREAMBLE

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

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

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

a. ISSUED TO (*Name and Address*)

NAC Services Inc.
655 Engineering Drive
Norcross, Georgia 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

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

c. DOCKET NUMBER 71-9235

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: NAC-STC (NS4FR)

(2) Description

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

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

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

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

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

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

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

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

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

The fuel basket within the cask cavity can accommodate up to 26 PWR fuel assemblies. The fuel assemblies are positioned within square sleeves made of stainless steel. Boron-10 is encased within the walls of the sleeves. The sleeves are laterally supported by 31, 1/2-inch thick, 70.86 inch diameter stainless steel disks. The basket also has 20 fins made of Type 6061-T6 aluminum alloy. The support disks and fins are connected by six, 1-5/8-inch diameter by 161-inch long threaded rods made of Type 17-4 PH stainless steel.

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

(3) Drawings

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

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

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(b) Contents

(1) Type and form of material

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

Assembly Type	14x14	15x15	16x16	17x17	17x17 (OFA)
Cladding Material	Zirc-4	Zirc-4	Zirc-4	Zirc-4	Zirc-4
Maximum Initial Uranium Content (kg/assembly)	407	469	426	464	426
Maximum Initial Enrichment (wt% ^{235}U)	4.2	4.2	4.2	4.2	4.1
Assembly Cross-Section (in)	8.11	8.20 to 8.54	8.10 to 8.14	8.43 to 8.54	8.43
Number of Fuel Rods per Assembly	179	204	236	264	264
Fuel Rod OD (in)	0.422 to 0.440	0.417 to 0.430	0.382	0.374 to 0.379	0.360
Minimum Cladding Thickness (in)	0.023	0.024	0.025	0.023	0.023
Pellet Diameter	0.344 to 0.377	0.358 to 0.390	0.325	0.3225 to 0.3232	0.3088
Maximum Active Fuel Length (in)	145.20	144	150	144	144

(2) Maximum quantity of material per package

Twenty six (26) PWR fuel assemblies

(3) Fissile Class I

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

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

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

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

   (a) Before first use of each packaging;

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

   (c) After seal replacement.

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

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

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

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

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

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

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

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

15. Expiration date: September 30, 1999.

REFERENCES

Nuclear Assurance Corporation application dated September 27, 1990.

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

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

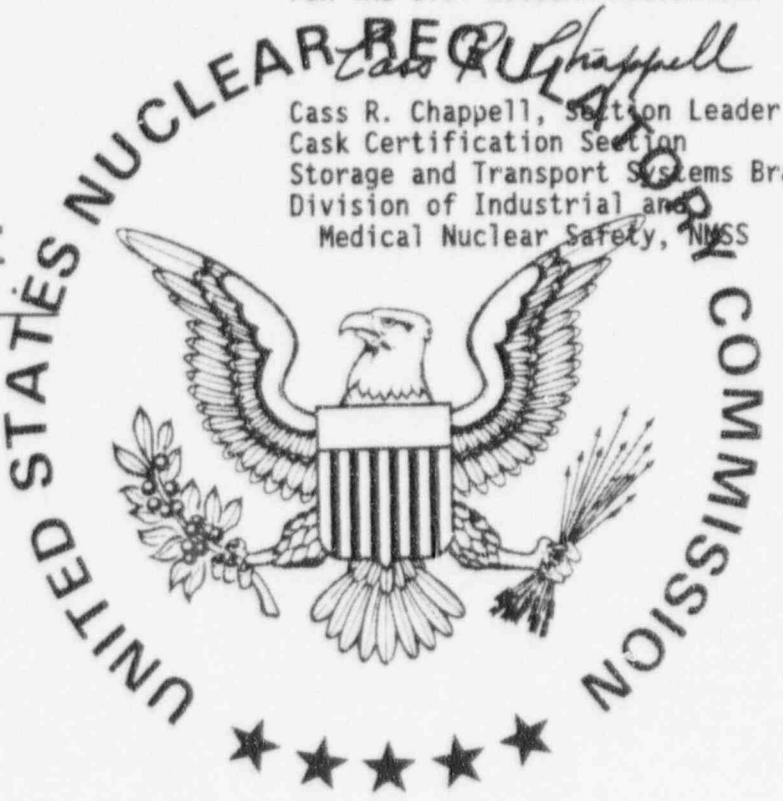
FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

SEP 30 1994

Date



NRC FORM 618
(8-89)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9239	3	USA/9239/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)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Westinghouse Electric Corporation
application dated January 31, 1991,
as supplemented.

c. DOCKET NUMBER

71-9239

4. CONDITIONS

This 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.: MCC-3, MCC-4, and MCC-5

(2) Description

The MCC packages are shipping containers for unirradiated uranium oxide fuel assemblies. The packagings consist of a steel fuel element cradle assembly equipped with a strongback and an adjustable fuel element clamping assembly. The cradle assembly is shock mounted to a 14-gauge carbon steel outer container by shear mounts. The MCC-3 container is closed with thirty 1/2-inch T-bolts. The MCC-4 and MCC-5 containers are closed with fifty 1/2-inch T-bolts.

The MCC-3 and MCC-4 containers are permanently equipped with vertical Gd_2O_3 neutron absorber plates that are mounted on the center wall of the strongback. Additional horizontal Gd_2O_3 neutron absorber plates, mounted on the underside of the strongback, are required for the contents as specified.

The MCC-5 container is permanently equipped with both the vertical and horizontal Gd_2O_3 neutron absorber plates. Additional vee-shaped, guided Gd_2O_3 neutron absorber plates are required for the contents as specified.

Approximate dimensions of the MCC-3 packaging are 44-1/2 inches O.D. by 194-1/2 inches long. The gross weight of the packaging and contents is 7,544 pounds. The maximum weight of the contents is 3,300 pounds.

Approximate dimensions of the MCC-4 packaging are 44-1/2 inches O.D. by 226 inches long. The gross weight of the packaging and contents is 10,533 pounds. The maximum weight of the contents is 3,870 pounds.

Approximate dimensions of the MCC-5 packaging are 44-1/2 inches O.D. by 226 inches long. The gross weight of the packaging and contents is 10,533 pounds. The maximum weight of the contents is 3,700 pounds.

5. (a) Packaging (continued)

(3) Drawings

The MCC-3 packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. MCCL301, Sheets 1, 2 and 3, Rev. 4.

The MCC-4 packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. MCCL401, Sheets 1, 2, 3, and 4, Rev. 5.

The MCC-5 packaging is constructed in accordance with Westinghouse Electric Corporation Drawing No. MCCL401, Sheets 1 through 9, Rev. 2.

(b) Contents

(1) Type and form of material

Unirradiated PWR uranium dioxide fuel assemblies with a maximum uranium-235 enrichment of 5.0 weight percent.

The fuel assemblies shall meet the specifications given in Westinghouse Drawing No. 6481E15, Rev. 3, and in the following tables of Appendix 1-4 of the application, as supplemented:

Table 1-4.1, Rev. 6, dated July 26, 1994	Fuel Assembly Parameters 14x14 Type Fuel Assemblies
Table 1-4.2, Rev. 6, dated July 26, 1994	Fuel Assembly Parameters 15x15 Type Fuel Assemblies
Table 1-4.3, Rev. 6, dated July 26, 1994	Fuel Assembly Parameters 16x16 Type Fuel Assemblies*
Table 1-4.4, Rev. 6, dated July 26, 1994	Fuel Assembly Parameters 17x17 Type Fuel Assemblies*
Table 1-4.5, Rev. 4, dated January 14, 1994	Fuel Assembly Parameters VVER-1000 Type Fuel Assembly**

* 16x16 CE fuel assemblies and the 17x17 W-STD/XL fuel assemblies may be shipped only in the Model No. MCC-4 package.

** VVER-1000 fuel assemblies may be shipped only in the Model No. MCC-5 package.

(2) Maximum quantity of material per package

Two (2) fuel assemblies

5. (c) Fissile Class I

6. For shipments of 14x14, 15x15, 16x16, and 17x17 fuel assemblies with U-235 enrichments of over 4.65 wt% and up to 5.0 wt%, horizontal Gd_2O_3 neutron absorber plates shall be positioned underneath each assembly. The horizontal absorber plates shall be placed horizontally on the underside of the strongback, as shown on Westinghouse Electric Corporation Drawing No. MCCL301, Sheet 1, Rev. 4, or Westinghouse Electric Corporation Drawing No. MCCL401, Sheet 1, Rev. 5.

7. For shipments of VVER-1000 fuel assemblies with U-235 enrichments of over 4.80 wt% and up to 5.0 wt%, a guided Gd_2O_3 neutron absorber plate shall be positioned underneath each assembly. The guided absorber plates shall be placed horizontally on the topside of the strongback, as shown on Westinghouse Electric Corporation Drawing No. MCCL501, Sheet 5, Rev. 2.

8. Each fuel assembly must be unsheathed or must be enclosed in an unsealed plastic 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 flow of liquids into or out of the sheathed fuel assembly.

9. The dimensions, minimum Gd_2O_3 loading and coating specifications, and acceptance testing of the neutron absorber plates shall be in accordance with the "Gd_2O_3 Neutron Absorber Plates Specifications," Appendix 1-6, Rev. 2, dated January 14, 1994, of the application. The minimum Gd_2O_3 coating areal density on the vertical and horizontal neutron absorber plates shall be 0.054 g-Gd_2O_3/cm^2. The minimum Gd_2O_3 coating areal density on guided neutron absorber plates shall be 0.027 g-Gd_2O_3/cm^2.

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

(a) The MCC-3 packaging shall be acceptance tested in accordance with Notes 3, 4 and 5 of Westinghouse Electric Corporation Drawing No. MCCL301, Sheet 1, Rev. 4, and with the Acceptance Tests in supplement dated May 12, 1992.

(b) The MCC-4 packaging shall be acceptance tested in accordance with notes 4, 5, and 6 of Westinghouse Electric Corporation Drawing No. MCCL401, Sheet 2, Rev. 5, and with the Acceptance Tests in supplement dated May 12, 1992.

(c) The MCC-5 packaging shall be acceptance tested in accordance with the Acceptance Tests in supplement dated May 12, 1992.

(d) The packages shall be maintained in accordance with the Maintenance Program in supplement dated May 12, 1992.

(e) The packages shall be operated and prepared for shipment in accordance with the Operating Procedures in supplement dated January 14, 1994, as revised in supplement dated August 2, 1994.

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: November 30, 1996.

REFERENCES

Westinghouse Electric Corporation application dated January 31, 1991.

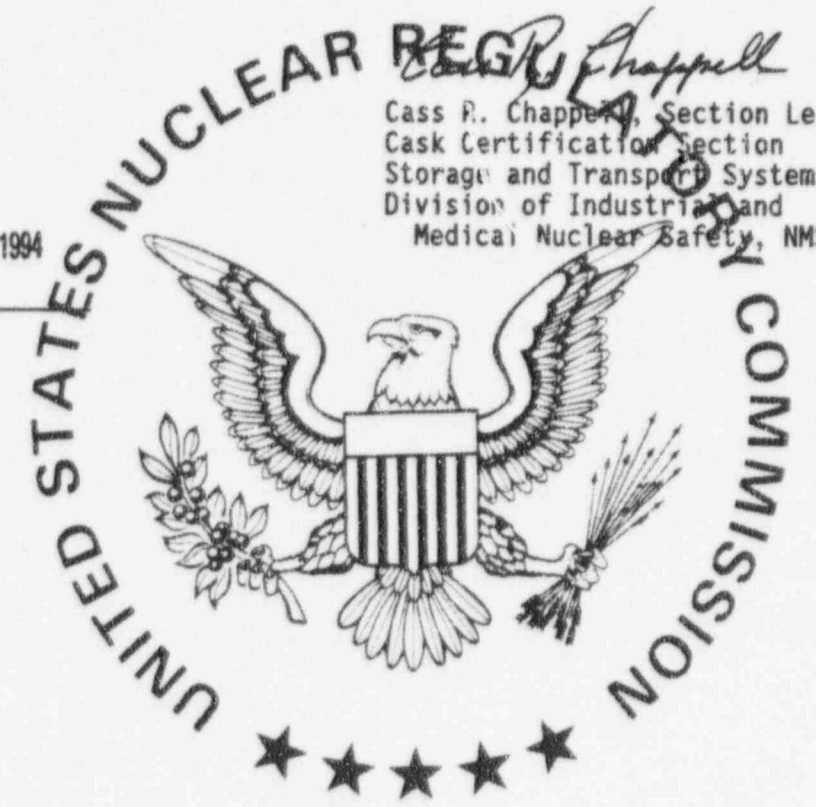
Supplements dated: October 2, October 9, November 1, and November 13, 1991; January 27, March 30, May 12, and June 18, 1992; August 18, 1993; and January 14, April 22, May 24, July 26, and August 2, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: AUG 2 3 1994



NRC FORM 618
(9-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9245	3	USA/9245/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)*

Burnley Technology, Inc.
Post Office Box 1226
Plaistow, NH 03865

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

RTS Technology, Inc., application dated August 20, 1992, as supplemented.

c. DOCKET NUMBER 71-9245

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No. 420

(2) Description

Radiographic device within a protective overpack. The overpack consists of an outer container which is a 10-gallon open head steel drum (14 inches in diameter and 17.25 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 inch thick molded asbestos free liner on the top, bottom, and sides, plus molded polyurethane fill to position and secure the radiographic device within the drum. Maximum gross weight of the package not to exceed 75 pounds. The maximum weight of the radiography devices within the package shall not exceed 51 pounds.

(3) Drawings

The overpack must be constructed in accordance with Burnley Technology Inc., Drawing Nos. 42400, Rev. 0; 42500, Rev. 0; and 42600, Rev. 0.

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 424: RTS Technology, Inc., Drawing Nos. 42401, Sheets 1 & 2, Rev. 1; 42402, Rev. 3; 42403, Rev. 3; 42404, Sheets 1, 2, and 3, Rev. 0; 42407, Rev. 0; 42408, Rev. 0; 42415, Rev. 3; 42416, Rev. 0; 42417, Rev. 1; 42421, Rev.0; 42422, Rev. 0; 42423, Sheets 1 & 2, Rev. 1; 42424, Rev. 1; 42425, Rev. 0; and 42426, Rev. 0.

For the Model No. 425: RTS Technology, Inc., Drawing Nos. 42501, Rev. 0; 42503, Rev. 0; 42505, Sheets 1 & 2, Rev. 0; 42506, Rev. 2; 42551, Rev. 1; 42552, Rev. 0; and 42558, Rev. 0.

For the Model No. 426: RTS Technology, Inc., Drawing Nos. 42601, Rev. 0; 42605, Rev. 0; 42606, Rev. 0; and 42609, Rev. 0.

(b) Contents

(1) Type and form of material

Iridium-192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

200 Curies.

6. The sources 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 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) Each package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application.

(b) Each packaging must meet the Maintenance Program and Acceptance Tests in Chapter 8 of the application. In addition, each container should be visually examined to assure that the container meets the specifications as described in the drawings specified in 5(a)(3) of the certificate.

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

9. Expiration date: September 30, 1997.

REFERENCES

RTS Technology, Inc., application dated August 20, 1992.

RTS Technology, Inc., supplements dated: July 31, 1991; and October 16, 1992.

Burnley Technology, Inc., supplements dated: October 16, 1992; and June 17, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: NOV 0 1 1994

NRC FORM 618
(5-89)
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
9246	0	USA/9246/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)*

National Institute of
Standards and Technology
Gaithersburg, MD 20899

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

National Institute of Standards and Technology application dated February 7, 1992, as supplemented.

c. DOCKET NUMBER 71-9246

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: ST

(2) Description

A closed steel pipe for the transport of an unirradiated research reactor fuel element. The pipe is a 5-1/2-inch OD carbon steel pipe, approximately 71 inches in length, with a closed bottom end and flanged top end. The top end is closed by a cover plate, which is 1/4-inch thick, and 6-1/2 inches in diameter, and a gasket. The cover plate is secured to the pipe flange by 8 cap screws. A wooden nozzle support and top support position the fuel assembly within the pipe. The package weighs approximately 75 lbs., including the fuel element.

(3) Drawing

The packaging is constructed and assembled in accordance with National Institute of Standards and Technology Drawing No. D-04-048, Sheet 1, Rev. 2, and Sheet 2, Rev. 2.

CONDITIONS *(continued)*

Page 2 - Certificate No. 9246 - Revision No. 0 - Docket No. 71-9246

5. (b) Contents

(1) Type and form of material

Unirradiated NBSR fuel element composed of enriched uranium and aluminum.

(2) Maximum quantity of material per package

One fuel element containing 360 grams U-235.

(c) Fissile Class III

Maximum number of packages per shipment: 2

6. In addition to the requirements of Subpart G of 10 CFR Part 71, the package shall be prepared for shipment, operated, and maintained in accordance with the loading, unloading, and quality assurance procedures in the application. Prior to each shipment, the shipper shall make the determinations specified in the NIST "ST" Series Shipping Container Shipper's Checklist in 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: February 28, 1997.

REFERENCES

National Institute of Standards and Technology application dated February 7, 1992.

Supplement dated: February 14, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: FEB 26 1992

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
9247	0	USA/9247/A	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 July 31, 1992, as supplemented.

c. DOCKET NUMBER 71-9247

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 110G-A

(2) Description

Concrete-filled, 110-gallon drum for transport of wastes meeting the requirements of low specific activity radioactive material. The package is composed of an inner, DOT specification 17H, 55-gallon drum, excluding lid, centered within an outer, 110-gallon drum by 5,000 psi compressive strength concrete. After waste emplacement in the inner drum, concrete is poured to fill the inner drum and to extend above the top chime of the inner drum. The outer drum and lid are 16-gage steel. The outer drum is closed by a 12-gage steel locking ring with drop forged lugs, a 3/8-inch smooth neoprene gasket, and a 5/8-inch diameter bolt. The maximum weight of the package, including contents, is 2700 pounds.

(3) Drawings

The packaging is constructed in accordance with Nuclear Fuel Services, Inc. Drawing No. 000-M0034-B, Rev. B.

CONDITIONS *(continued)*

(b) Contents

(1) Type and form of material

Dry, solid waste material meeting the requirements of low specific activity radioactive material. The waste material is in the form of disks composed of super-compacted 40-gallon drums containing non-compactible or compacted wastes.

(2) Maximum quantity of material per package

Greater than Type A quantities of radioactive materials. The maximum weight of waste material is 1,000 pounds. The contents may include fissile materials provided that the total quantity of fissile material per package meets the mass limit specified in 10 CFR §71.53(a).

6. (a) For any package containing water 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:

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 package gas void if present at STP (i.e., no more than 0.065 g-moles/ft^3 at 14.7 psia and 70 °F).

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

(b) For any package shipped within 10 days after sealing of the drum, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Radioactivity per package shall be determined in accordance with Sections 1.2.4 and 4.8 of the application.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, the package shall be prepared for shipment and operated in accordance with Section 4 of the application.

9. This certificate authorizes land transport between the vicinities of Oak Ridge, Tennessee, and Barnwell, South Carolina, only.

10. The package authorized by this certificate must be transported on a motor vehicle or railroad car assigned for sole use of the licensee.

CONDITIONS *(continued)*

Page 3 - Certificate No. 9247 - Revision No. 0 - Docket No. 71-9247

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, 1998.

REFERENCES

Nuclear Fuel Services, Inc. application dated July 31, 1992.

Supplement dated: November 25, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date JAN 2 2 1993

NRC FORM 618
(9-83)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9248	6	USA/9248/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
PO Box 130
Richland, WA 99352-0130

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Siemens Power Corporation application dated June 28, 1993, as supplemented.

c. DOCKET NUMBER 71-9248

4. CONDITIONS

This 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.: SP-1 and SP-2

(2) Description

Fuel assembly and fuel rod shipping containers. The packages consist of a right rectangular metal inner container and a wooden outer container, with cushioning material between the inner and outer containers.

The metal inner container is approximately 11-1/2 inches by 18 inches by 179-1/2 inches long and is positioned within a wooden outer container approximately 30 inches by 31 inches by 207 inches long. The SP-1 and SP-2 packagings differ in the length of the metal inner container and end piece. Cushioning is provided between the inner and outer containers by phenolic impregnated honeycomb and ethafoam, or equivalent. Closure is accomplished by bolts, latches or equivalent. A pressure relief (breather) valve is provided on the inner container, and is set for 0.5 psi differential. The maximum weight of the packaging and contents is 2,800 pounds.

(3) Drawings

The packagings are fabricated and assembled in accordance with the following Siemens Nuclear Power Corporation/Advanced Nuclear Fuels Corporation Drawing Nos.:

EMF-306,416, Rev. 1.
EMF-306,424, Rev. 1.
EMF-304,416, Rev. 5.
EMF-306,272, Sheets 1 through 4, Rev. 6.
EMF-308,257, Rev. 1.

5.(a) Packaging (Continued)

(4) Product Container

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

5.(b) Contents

(1) Type and form of material

(I) UO_2 fuel rods with a maximum U-235 enrichment of 6.5% by weight. Rods are clad with Zircaloy, Incaloy, Inconel or stainless steel such that the ratio of clad to fuel cross sectional area be at least 0.26, and a maximum fuel pellet outside diameter of 0.508 inch. Each rod must have a maximum length of 174 inches. The clad rods must be bundled (contained) in the product container described in 5(a)(4).

(ii) UO_2 fuel assemblies in a 7 x 7, an 8 x 8, or a 9 x 9 square array with a maximum fuel cross section area of 25 square inches, maximum fuel length of 174 inches and maximum average enrichment of 3.3 w/o U-235. Minimum zircaloy clad thickness is 0.025 inches, maximum pellet diameter is 0.555 inches. Any number of water rods in any arrangement are permitted.

(iii) UO_2 fuel assemblies in a 7 x 7, 8 x 8, or a 9 x 9 square array with a maximum fuel length of 174 inches, and a maximum average enrichment between 3.3 to 4.0 w/o U-235. The maximum pellet diameter is 0.555 inch, and the minimum clad thickness is 0.025 inch. Any number of water rods in any arrangement are permitted. Each assembly contains at least 4 rods with nominal 2 weight percent Gd_2O_3, which are in non-perimeter locations and are symmetric about the diagonal.

(iv) UO_2 fuel assemblies with a maximum U-235 enrichment of 5.0 percent by weight, and a maximum average U-235 enrichment of 4.0 percent by weight. Each fuel assembly is made up of fuel rods in a 10 x 10 square array, with a maximum fuel cross section of 5.022 inches square, a nominal pitch of 0.511 inch, and a maximum fuel length of 174 inches. The maximum pellet diameter is 0.3356 inch, the minimum clad thickness is 0.0225 inch, and the maximum U-235 enrichment in any edge rod is 4.0 percent by weight. Each assembly contains at least 6 rods with nominal 2 weight percent Gd_2O_3, which are symmetric about the diagonal, and each assembly contains at least 4 water rods in the 4 central rod positions.

(v) UO_2 fuel rods with a maximum U-235 enrichment of 5.0 percent by weight, and a minimum Gd_2O_3 content of 1.0 percent by weight. The rods may be clad with zircaloy, steel or aluminum. The rods have a maximum fuel pellet diameter of 0.5 inch, and a maximum fuel length of 169 inches.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package

Total weight of contents (fuel assemblies, fuel rods and rod shipping containers, or fuel bundles and product containers) not to exceed 1265 pounds.

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

Two fuel bundles. A bundle is defined as an arrangement of rods which is contained within a product container.

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

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 174 inches.

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

Any number of rods contained within rod shipping containers as shown on Siemens Power Corporation Drawing No. [illegible]-610,510, Sheets 1 and 2, Rev. 1 and Sheet 3, Rev. 0.

(c) Fissile Class

6. Each fuel assembly must be sheathed 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. Except for the contents described in 5(b)(1)(iv), polyethylene shipping shims may be inserted between rods within the fuel assemblies up to a maximum of 0.20 g H_2O hydrogen equivalent per cubic centimeter averaged over the assembly. For contents described in 5(b)(1)(iv), polyethylene shipping shims are not permitted.

8. In lieu of the product container specified in 5(a)(4), UO_2 fuel rods with a maximum enrichment of 3.2 w/o U-235 may be bundled (bound with steel strappings at two or more locations) with a maximum cross sectional area of 20.0 square inches. The total breaking strength of the strapping must be 30 times the weight of the bound rods.

9. The maximum spacing between adjacent rods within a bundle must be 0.012 inch. The spacing must be maintained by the product container wall, metal strappings or peripheral metallic dunnage with a melting point greater than 1475 °F.

10. Maximum average enrichment means the highest average enrichment through any cross sectional plane of the assembly.

11. 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 dated December 1, 1993.

    (b) Each packaging must be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 of the application dated December 1, 1993.

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

13. Expiration date: December 31, 1998.

REFERENCES

Siemens Power Corporation application dated June 28, 1993.

Supplements dated: December 1, 1993; December 23, 1994; and April 28, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

C. R. Chappell

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

Date: MAY 02 1995

NRC FORM 618
(5-85)
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
9249	1	USA/9249/A	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 June 25, 1993.

c. DOCKET NUMBER

71-9249

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CNS 14-170, Series III

(2) Description

Steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 81-1/2 inches high by 81-1/2 inches in diameter. The cask cavity is 73-3/8 inches high by 75-1/2 inches in diameter. The cask side wall consists of a 3/8-inch thick inner steel shell, a 1-3/4 inch lead shell, and a 7/8-inch thick outer steel shell. The base is comprised of two, 2-inch thick steel plates welded together to form a 4-inch thick base which is integrally welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall at the top. The lid is comprised of two, 2-inch thick steel plates, which are stepped and welded together to mate with the steel flange. The cask closure is sealed by a Neoprene gasket located between the lid and steel flange, positive closure of the lid is accomplished by eight, 1-3/4 inch ratchet binders. The lid contains a centrally located shield plug comprised of two, 2-inch thick steel plates and one, 1-inch thick steel plate stepped and welded. The shield plug is sealed by a Neoprene gasket, and eight, 3/4-inch studs and nuts are used to provide positive closure. The packaging is constructed of A-516, Grade 70, carbon steel. The outer shell has a minimum yield strength of 46,000 psi. Tie-down is accomplished by four tie-down lugs welded to the cask body. There are four cask lifting lugs, three lid lifting lugs, and one shield plug lifting lug. The package gross weight is approximately 53,000 pounds.

5.(a)(3) Drawings

The Model No. CNS 14-170, Series III packaging is fabricated in accordance with Chem-Nuclear Systems, Inc., Drawing Nos.: C-110-D-0016, Sheets 1 and 2, Rev. 4; C-110-D-0017, Sheets 1 and 2, Rev. C; C-110-D-0018, Sheets 1 and 2, Rev. C; and C-110-D-0019, Rev. B.

(b) Contents

(1) Type and form of material

Process solids, either dewatered, solid or solidified, meeting the requirements for low specific activity material, in secondary containers.

(2) Maximum quantity of material per package

Greater than Type A quantity of radioactive material which may contain fissile material provided the fissile material does not exceed the limits in 10 CFR §71.53. The weight of the contents, and secondary containers shall not exceed 17,800 pounds. The internal decay heat load shall not exceed 7 watts.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements 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/ft3 at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have hydrogen greater than 5%.

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

(b) For any package shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

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

   (a) Prior to each shipment, the packaging lid seals, if opened (or if security seal is broken), must be inspected. The seals must be replaced with new seals if inspection shows any defects or every 12 months, whichever occurs first.

   (b) Each package must meet the Acceptance Tests and Maintenance Program in Chapter 7.0 of the application.

   (c) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 6.0 of the application.

8. Torque requirements for closure fasteners:

   (a) Primary lid ratchet binders must be torqued to 175-200 ft-lbs.

   (b) Secondary lid bolts must be torqued to 120 ± 10 ft-lbs.

9. The package authorized by this certificate must be transported on a motor vehicle, railroad car, aircraft, inland watercraft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

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: July 31, 1998.

REFERENCES

Chem-Nuclear Systems, Inc., application dated June 25, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Nancy L. Osgood for

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

Date: AUG 06 1993

NRC FORM 618
(9-83)
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
9250	2	USA/9250/B(U)F	1	3

PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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 and Wilcox Company
P. O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Babcock and Wilcox Company
application dated October 29, 1992,
as supplemented.

c. DOCKET NUMBER

71-9250

4. CONDITIONS

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

5

(a) Packaging

(1) Model No.: NNFC-5X22

(2) Description

A shipping container for unirradiated uranium of any enrichment. The outer drum is a DOT Specification 17C, 55-gallon drum with a heavy-duty clamp ring and Forget lugs. The inner vessel (containment vessel) is a Schedule 40S stainless steel pipe with a welded bottom cap and bolted weldneck flange. The inner vessel lid is a blind flange which is bolted to the weldneck flange with eight hex-head bolts. The closure includes double silicone O-ring seals and a leak-test port. The dimensions of the inner vessel are 5 inches ID by 22 inches high. The inner vessel is centered within the outer drum by fiberboard and supported by plywood disks. The maximum weight of the package, including contents, is 300 pounds.

(3) Drawing

The packaging is constructed in accordance with B&W Fuel Company Drawing Nos. 1220276 E, Rev. 1, and 1220277 E, Rev. 2.

(b) Contents

(1) Type and form of material

(i) Unirradiated uranium as solid metals, compounds, or alloys which do not decompose at temperatures up to 250 °F; uranium oxides as powder or pellets; and uranyl nitrate as crystals. The uranium may be of any U-235 or U-233 enrichment. Carbide compounds are not authorized.

5. (b) (1) Type and form of material (continued)

(ii) Unirradiated liquid uranyl nitrate solution in sealed glass containers or screw top plastic vials, each within one or more additional plastic vials with taped lids, and within a sealed product can or polyethylene bottle containing a sufficient amount of vermiculite to absorb twice the liquid contents present. The uranium may be of any U-235 enrichment. U-233 greater than a Type A quantity is not permitted.

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

The weight of the material shall not exceed 50 pounds, and:

(i) For the material described in Item 5(b)(1)(i), above, with an H/U ≤ 3 considering all sources of moderation in the inner vessel, each shipment must be limited as follows:

Fissile Class	Fissile Material	Max. Fissile Material per Package (kg)	Max. Number Packages per Shipment
III	U-235	9.0	1

(ii) For the material described in Item 5(b)(1)(i), above, with an H/U ≤ 20 considering all sources of moderation in the inner vessel, each shipment must be limited as follows:

Fissile Class	Fissile Material	Max. Fissile Material per Package (kg)	Max. Number Packages per Shipment	Min. TI
II	U-233	0.5	---	1.8
III	U-233	0.5	57	---
III	U-235	4.0	1	---

(iii) For the material described in item 5(b)(1)(ii), above:

The fissile material shall not exceed 400 grams U-235. The quantity of uranyl nitrate shall not exceed 1000 mL of solution.

Fissile Class I

6. The vent holes on the DOT Specification 17C drum shall be capped or taped closed during transport and storage to preclude entry of rain water into the packaging.

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 Chapter 7 of the application.

   (b) Each package shall be acceptance tested and maintained in accordance with 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, 1998.

REFERENCES

Babcock and Wilcox Company application dated October 29, 1992.

Supplements dated: January 22, 1993; November 2, 1993; and November 30, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: DEC 0 8 1994

NRC FORM 618
(6-88)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9251	3	USA/9251/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)

B&W Fuel Company
P.O. Box 11646
Lynchburg, VA 24506-1646

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

B&W Fuel Company application
dated May 26 1992, as supplemented.

c. DOCKET NUMBER 71-9251

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: BW-2901

(2) Description

A shipping container for low-enriched uranium oxide powder and pellets, composed of an inner container, surrounded by insulating material, and an outer drum. The inner container is 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 welded bottom sheet. The 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. The gross weight of the package is approximately 660 pounds.

(3) Drawings

The packaging is constructed in accordance with B&W Fuel Company Drawing Nos. 1215598B, Rev. 0, and 1215599E, Rev. 1.

(b) Contents

(1) Type and form of material

(i) Sintered uranium oxide pellets enriched to a maximum 5.1 w/o in the U-235 isotope. The minimum pellet diameter is 0.315 inch, and the maximum pellet diameter is 0.375 inch.

(ii) Uranium dioxide as powder, pellets, or any combination thereof, enriched to a maximum 5.1 w/o in the U-235 isotope.

(2) Maximum quantity of material per package

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

370 pounds, with the U-235 content not to exceed 7.6 kg. Pellets must be packaged on trays in accordance with B&W Fuel Company Drawing Nos. 1215597D, Rev. 1, and 1215600D, Rev. 0. The maximum weight of polyethylene within the inner container shall not exceed 1500 grams per package.

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

370 pounds. Uranium dioxide must be packaged in boxes in accordance with B&W Fuel Company Drawing Nos. 1215597D, Rev. [illegible] and 1215600D, Rev. 0. The maximum weight of polyethylene within the inner container shall not exceed 2400 grams per package.

(c) Fissile Class II and III

(1) Minimum transport index to be shown on label for Class II 0.7

(2) Maximum number of packages per shipment for Class III 144

6. Prior to each shipment the insert (containment vessel) gasket shall be inspected. This gasket shall be replaced if inspection shows any defects or every twelve (12) months, whichever occurs first.

7. For the contents described in 5(b)(1)(i) and limited in 5(b)(2)(i), each pellet box must contain at least 10 trays of pellets. Each of these trays must be fully loaded with pellets. Void spaces within a pellet box must be filled with aluminum spacers or empty trays. For packages with fewer than six pellet boxes, solid aluminum or wood pellet box spacers must be substituted for pellet boxes. The pellet boxes, pellet box spacers, and wood boards must provide a snug axial and cross sectional fit in the inner container.

8. For the contents described in 5(b)(1)(ii) and limited in 5(b)(2)(ii), each package must contain no more than four loaded pellet boxes. The remaining spaces must be filled with solid wood or aluminum pellet box spacers. The center board must be nominal 1/2-inch thick stainless steel plate. The pellet boxes, pellet box spacers, and wood boards must provide a snug axial and cross sectional fit in the inner container.

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

   (i) Each packaging must be maintained and acceptance tested 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.

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: August 31, 1997.

REFERENCES

B&W Fuel Company application dated May 26, 1992.

Supplements dated: August 3 and October 30, 1992; April 30, 1993; and May 24, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Jess C. Chappell, Section Leader
Cask Certification Section
Special Projects Branch
Office of Nuclear Material
Safety and Safeguards

Date: May 25, 1995

NRC FORM 618
(9-86)
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
9252	1	USA/9252/AF	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*)

B&W Fuel Company
PO Box 11646
Lynchburg, VA 24506-1646

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

B&W Fuel Company application dated March 9, 1993, as supplemented.

c. DOCKET NUMBER 71-9252

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 51032-2

(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. Nine separator blocks, which are 6" x 8" x 8-1/2" long and have a 3/8" thick wall and a rectangular gusset plate welded inside, are bolted between fuel bundles. The outer container is composed of an 11 gauge steel shell approximately 43" diameter by 216" long. The maximum weight of the package, including contents, is 7,500 pounds.

(3) Drawings

The packaging is constructed and assembled in accordance with the following B&W Fuel Company Drawing Nos.: 1215926 C, Rev. 1; 1215929 D, Rev. 2; 1215930 D, Rev. 2; 1215931 D, Rev. 2; 1215932 D, Rev. 2; 1215933 D, Rev. 2; 1215934 C, Rev. 1; 1215935 D, Rev. 2; 1216010 D, Rev. 1.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies, composed of uranium dioxide fuel pellets clad in zircaloy tubes. Uranium is enriched to a maximum of 5.05 w/o in the U-235 isotope. The fuel assemblies may contain inserted control rod assemblies. The fuel assemblies have the following specifications:

Type	15x15	15x15	17x17	17x17	15x15
Rods Per Assembly	208	204	264	264	204
Nominal Rod Pitch (in.)	0.568	0.563	0.501	0.496	0.5625
Maximum Pellet Diameter (in.)	0.3707	0.3671	0.3252	0.3232	0.3672
Maximum Pellet Density (%TD)	97.5	97.5	97.5	97.5	97.5
Nominal Clad OD (in.)	0.430	0.422	0.379	0.374	0.422
Nominal Clad ID (in.)	0.377	0.370	0.332	0.326	0.368
Assembly Cross Section (in.)*	8.520	8.445	8.517	8.432	8.438
Active Fuel Length (in.)	144	144	144	144	120
Maximum U-235 Loading (kg)	25.20	24.24	24.62	24.32	20.20

* Assembly cross section is the product of the nominal rod pitch and the number of rods per edge.

(2) Maximum quantity of material per package

Two fuel assemblies. Total weight of fuel assemblies, including control rod assemblies, not to exceed 3400 pounds.

5. (c) Fissile Class I

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. 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 Chapter 7.0 of the application.

   (b) Each packaging shall be maintained in accordance with Section 8.2 of the application.

   (c) Each packaging shall meet the acceptance tests in Section 8.1 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, 1998.

REFERENCES

B&W Fuel Company application dated March 9, 1993.

Supplements dated: May 10, and July 7, 1993; April 8, and April 13, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: APR 18 1994

NRC FORM 618
(5-85)
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
9253	0	USA/9253/B(U)F	1	3

PREAMBLE

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

Public Service Company
of Colorado
Platteville, Colorado 80651

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Public Service Company of Colorado
application dated March 31, 1993,
as supplemented

c. DOCKET NUMBER 71-9253

4. CONDITIONS

This certificate 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-FSV

(2) Description

A steel and lead shielded shipping cask for irradiated high temperature gas cooled reactor (HTGR) fuel elements. The cask is a right circular cylinder, with a balsa and redwood impact limiter at each end. The package has approximate dimensions and weights as follows:

Cavity diameter	18 inches
Cavity length	199 inches
Cask body outer diameter	31 inches
Lead shield thickness	3.44 inches
Package overall outer diameter, including impact limiters	78 inches
Package overall length, including impact limiters	247 inches
Packaging weight	42,000 pounds
Gross package weight, including contents	47,000 pounds

The cask body is made of two concentric shells of Type 304 stainless steel, welded to a bottom plate and a top closure flange. The inner shell has an ID of 18 inches and is 1.12 inches thick. The outer shell has an OD of approximately 30 inches and is 1.5 inches thick. The annular space between the inner and outer shells is filled with lead. The bottom plate is 5.5-inch thick Type 304 stainless steel. The closure lid is 2.5-inch thick Type 304 stainless steel, and is fully recessed into the cask top flange. The lid is fastened to the cask body by 12, 1-inch diameter closure bolts. The lid is sealed with double silicone O-rings, equipped with a leak test port. A vent port and drain port are sealed with single silicone O-rings and cover plates. The cask body is covered with a stainless steel thermal shield composed of 0.25-inch thick stainless steel plate over a wire wrap. The impact limiters are constructed of balsa and redwood encased in stainless steel shells.

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

The cask has two lifting sockets bolted to the cask top flange. Two rear trunnions are provided for cask tie-down.

The fuel elements are stacked in a carbon steel fuel storage container, which has an OD of approximately 17.6 inches and an overall length of 195 inches. The fuel storage container has a 0.5-inch thick shell, a 2.0-inch thick bottom plate, and a 1.5-inch thick lid. The lid accommodates a removable depleted uranium plug.

(3) Drawings

The packaging is constructed and assembled in accordance with the following Transnuclear, Inc. Drawing Nos.:

1090-SAR-1, Rev. 1	1090-SAR-6, Rev. 1
1090-SAR-2, Rev. 1	1090-SAR-7, Rev. 1
1090-SAR-3, Rev. 1	1090-SAR-8, Rev. 1
1090-SAR-4, Rev. 1	1090-SAR-9, Rev. 1
1090-SAR-5, Rev. 1	1090-SAR-10, Rev. 1

(b) Contents

(1) Type and form of material

Irradiated HTGR fuel elements. Each fuel element consists of a graphite block containing fuel rods. The fuel is composed of thorium/uranium carbide and thorium carbide fuel particles within the fuel rods. The graphite block is hexagonal in cross section and is approximately 14.2 inches across the flats and 31.2 inches long. Each fuel element contains a maximum of 1.4 kg of uranium enriched to a maximum of 93.5 weight percent U-235 and approximately 11.3 kg of thorium. The maximum burnup is approximately 70,000 MWD/MTIHM, and the minimum cool time is 1600 days.

(2) Maximum quantity of material per package

Six fuel elements, with decay heat not to exceed 60 watts per fuel element. The fuel elements are contained within a fuel storage container. Total weight of contents not to exceed 5,000 pounds, including fuel elements, fuel storage container, and depleted uranium shield plug.

(c) Fissile Class III

Maximum number of packages per shipment One

6. The package must be leak tested as follows:

   (a) Within the 12-month period prior to shipment, and after seal replacement, the package must be tested to show a leak rate no greater than 1×10^{-3} std-cm^3/sec. The leak test must have a sensitivity of at least 5×10^{-4} std-cm^3/sec.

   (b) Prior to each shipment, the package seals (main seal and vent seal) must be leak tested in accordance with Section 7.1.2 of the application. The acceptance criterion is a leak rate no greater than 1×10^{-3} std-cm^3/sec. The test must have a sensitivity of at least 1×10^{-3} std-cm^3/sec. The drain seal must also be tested if the drain port cover has been removed since the seal was last leak tested.

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 of Chapter 7 of the application.

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

   (c) Prior to each shipment, the cask main closure seal and vent seal must be inspected. The drain seal must be inspected if the drain port cover has been removed during preparation for shipment. All seals must be replaced within the 12-month period prior to shipment, or earlier if inspection shows any defect.

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

9. Expiration date: May 31, 1999.

REFERENCES

Public Service Company of Colorado application dated March 31, 1993.

Supplements dated: February 24, June 2, and June 14, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

JUN 15 1994

Date _____

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
9254	0	USA/9254/A	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 July 2, 1993.

c. DOCKET NUMBER 71-9254

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: 40G-A

(2) Description

Packaging for transport of wastes meeting the requirements of low specific activity radioactive material. The packaging consists of a 40-gallon, 20-gauge carbon steel, open-head drum. The drum is closed by a 20-gauge, carbon steel lid; a 3/8-inch, half-round tubular, smooth, black neoprene gasket; a 12-gauge, forged steel, closure ring; and a 5/8-inch diameter bolt. The dimensions of the packaging are 36 inches high by 18-1/4 inches outer diameter. The maximum weight of the package, including contents, is 333 pounds.

(3) Drawings

The packaging is constructed in accordance with Nuclear Fuel Services, Inc., Drawing No. 000-M0075-B, Revision A.

(b) Contents

(1) Type and form of material

Dry, solid waste material meeting the requirements of low specific activity radioactive material. The waste material is in the form of non-compactible materials and compacted bales, approximately 16 inches by 16 inches and 2 to 10 inches thick. The material shall have no sharp points, edges, or corners and shall be triple-wrapped in plastic.

(2) Maximum quantity of material per package

Greater than Type A quantities of radioactive materials. The maximum weight of the waste material is 300 pounds. The contents may include fissile material provided that the total quantity of fissile material per package meets the mass limit specified in 10 CFR §71.53(a).

Page 2 - Certificate No. 9254 - Revision No. 0 - Docket No. 71-9254

6. (a) For any package containing water or organic substance 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:

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 package gas void if present at STP (i.e., no more than 0.065 g-moles/ft^3 at 14.7 psia and 70 °F).

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

(b) For any package shipped within 10 days after sealing of the drum, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. Radioactivity per package shall be determined in accordance with Sections 1.2.4 and 4.8 of the application.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, the package shall be prepared for shipment and operated in accordance with Section 4 of the application.

9. The package authorized by this certificate must be transported on a motor vehicle or railroad car assigned for sole use of the licensee.

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

11. Expiration date: September 30, 1998.

REFERENCES

Nuclear Fuel Services, Inc., application dated July 2, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: SEP 15 1993

NRC FORM 618
(9-83)
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
9256	0	USA/9256/A	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*)

Yankee Atomic Electric Company
580 Main Street
Bolton, MA 01740-1398

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Yankee Atomic Electric Company application dated April 12, 1993, as supplemented.

c. DOCKET NUMBER 71-9256

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: YNPS Steam Generator

(2) Description

A steam generator filled with low density concrete, with seal-welded nozzle covers, impact limiters, and shear keys. The steam generator consists of the steam generator shell, internal U-tubes and tube supports. The steam generator is essentially cylindrical with an OD of approximately 8 feet 6-1/4 inches in the steam drum region and an OD of approximately 7 feet 1 inch in the tube bundle region. The shell wall thickness is approximately 2-3/4 inches in the tube bundle region and 3-1/8 inches in the steam drum region. The length of the steam generator package is approximately 40 feet 7-3/8 inches. The tube bundle is composed of 1620 U-tubes, which have an OD of approximately 3/4 inch, and an average wall thickness of 0.072 inch. The nozzles and other penetrations are covered with welded closures. The steam generator is filled with low density concrete on both primary and secondary sides. Three shear keys are welded to the steam generator shell bottom for axial restraint. Toroidal impact limiters, which are polyurethane foam with a carbon steel shell, are fixed at each end of the steam generator. Steel plates are welded onto the steam generator shell for radiation shielding, as required. The maximum weight of the package is approximately 273,000 pounds.

(3) Drawings

The package is constructed and assembled in accordance with the following Chem-Nuclear Systems, Inc. Drawing Nos.:

C-110-B-46063-1, Rev. 1
C-110-B-46063-2, Sheets 1 through 4, Rev. 0
C-110-D-46063-3, Sheets 1 and 2, Rev. 0
C-110-A-46063-4, Rev. 0

(b) Contents

(1) Type and form of material

Steam generator containing radioactive contamination, filled with low density concrete, meeting the requirements of low specific activity radioactive material.

(2) Maximum quantity of material per package

Greater than a Type A quantity of radioactive material. Fissile material may be present provided the fissile material meets the exemption standards of 10 CFR §71.53.

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

(a) The package must be prepared for shipment and transported in accordance with Chapters 7 and 8 of the application.

(b) The package must be transported in accordance with the operational controls of Table 1.1 of the application.

(c) Prior to transport, shielding must be welded onto the package in accordance with Chem-Nuclear Systems, Inc. Drawing No. C-110-B-46063-1, Rev. 1, as necessary, such that the package meets the external radiation standards of 10 CFR §71.47.

7. This certificate authorizes a one-time shipment for each of four packages from the Yankee Nuclear Power Station to a point near Barnwell, South Carolina.

8. The package authorized by this certificate must be transported on a motor vehicle and on a railroad car assigned for the sole use of the licensee.

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

10. Expiration date: September 30, 1998.

REFERENCES

Yankee Atomic Electric Company application dated April 12, 1993.

Supplements dated: April 20, July 30, August 2, and September 10, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date OCT 28 1993

NRC FORM 618
(8-89)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9259	0	USA/9259/A	1	3

2. PREAMBLE

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

Portland General Electric Company
71760 Columbia River Highway
Rainier, Oregon 97048

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Portland General Electric Company
application dated January 23, 1995,
as supplemented.

c. DOCKET NUMBER 71-9259

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: Trojan Steam Generator

(2) Description

A steam generator filled with low density cellular concrete, with seal-welded nozzle covers, and a shear key. The steam generator consists of the steam generator steel shell, internal inconel U-tubes, and the tube sheet and tube supports. The steam generator is essentially cylindrical with an OD of approximately 14 feet 8 inches in the upper shell (steam dome) region, and an OD of approximately 11 feet 4 inches in the lower shell (tube bundle) region. The shell wall thickness is approximately 3.6 inches in the upper shell region and 2.8 to 3.2 inches in the lower shell region. The length of the steam generator package is approximately 67 feet 8 inches. The tube bundle is composed of 3388 U-tubes, which have an OD of approximately 0.875 inch, and an average wall thickness of 0.05 inch. The nozzles and other penetrations are covered with welded closures. The steam generator is filled with low density cellular concrete on both primary and secondary sides. A series of five shear key bars are welded to the steam generator lower shell for axial restraint. Steel plates are welded onto the steam generator shell for radiation shielding, as required. The maximum weight of the package is approximately 900,000 pounds.

(3) Drawings

The package is constructed and assembled in accordance with the following Trojan Nuclear Plant drawings:

M-9249, Sheets 1 through 4, Rev. 0.
M-9250, Sheet 1, Rev. 0; Sheet 2, Rev. 0; Sheet 3, Rev. 0;
Sheet 4, Rev. 1; Sheet 5, Rev. 0; Sheet 6, Rev. 1;
Sheet 7, Rev. 1; Sheet 8, Rev. 1; Sheet 9, Rev. 0;
Sheet 10, Rev. 0; and Sheet 11, Rev. 0.
M-9251, Sheet 1, Rev. 0.

(b) Contents

(1) Type and form of material

Steam generator containing radioactive contamination, filled with low density cellular concrete, meeting the requirements of low specific activity radioactive material.

(2) Maximum quantity of material per package

Greater than a Type A quantity of radioactive material. Fissile material may be present provided the fissile material meets the exemption standards of 10 CFR §71.53.

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

(a) The package must be prepared for shipment and transported in accordance with Chapters 7 and 8 of the application.

(b) Prior to transport, shielding must be welded onto the package in accordance with Trojan Nuclear Plant Drawing No. M-9249, Sheets 1 through 4, Rev. 0, as necessary, such that the package meets the external radiation standards of 10 CFR §71.47.

7. Prior to transport, the National Cargo Bureau, Inc., must have evaluated the system used to support and tie down the package on the barge, and must have certified that the support and tie down system and the package stowage are in accordance with the regulations of the Commandant, United States Coast Guard.

8. Prior to transport, the United States Coast Guard must have inspected the condition of the vessel and the stowage of the package on the barge.

9. This certificate authorizes a one-time shipment for each of four packages from the Trojan Nuclear Plant to a point near Richland, Washington.

10. The package authorized by this certificate must be transported on a conveyance assigned for the sole use of the licensee.

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

12. Expiration date: June 30, 2000.

REFERENCES

Portland General Electric Company application dated January 23, 1995.

Supplements dated: May 2 and 3, and June 15, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date June 29, 1995

NRC FORM 618
(6-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9260	0	USA/9260/A	1	3

2. PREAMBLE

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

Portland General Electric Company
71760 Columbia River Highway
Rainier, Oregon 97048

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Portland General Electric Company
application dated January 23, 1995,
as supplemented.

c. DOCKET NUMBER 71-9260

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: Trojan Pressurizer

(2) Description

A reactor pressurizer, filled with low density cellular concrete, with seal-welded nozzle covers, and a shear key. The pressurizer consists of the pressurizer vessel, the support skirt, and heater elements. The pressurizer vessel is essentially cylindrical with an overall length of approximately 53 feet, and an OD of approximately 7 feet 8 inches. The shell wall thickness is approximately 4 inches along the cylinder wall, 2.5 inches in the upper head region, and 3 inches in the lower head region. The internal heater elements, which are approximately 9 feet long, are arranged in concentric rings in the lower region of the vessel. The pressurizer is filled with low density cellular concrete. A shear key assembly is welded to the pressurizer shell for axial restraint. Steel plates may be welded onto the support skirt flange for radiation shielding, as required. The maximum weight of the package is approximately 250,000 pounds.

(3) Drawings

The package is constructed and assembled in accordance with the following Trojan Nuclear Plant drawings:

M-9252, Sheets 1 through 3, Rev. 0.
M-9253, Sheets 1 through 8, Rev. 0.
M-9254, Sheet 1, Rev. 0.

(b) Contents

(1) Type and form of material

Pressurizer containing radioactive contamination, filled with low density cellular concrete, meeting the requirements of low specific activity radioactive material.

(2) Maximum quantity of material per package

Greater than a Type A quantity of radioactive material. Fissile material may be present provided the fissile material meets the exemption standards of 10 CFR §71.53.

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

(a) The package must be prepared for shipment and transported in accordance with Chapters 7 and 8 of the application.

(b) Prior to transport, shielding must be welded onto the package in accordance with Trojan Nuclear Plant Drawing No. M-3252, Sheet 3, Rev. 0, as necessary such that the package meets the external radiation standards of 10 CFR §71.47.

7. Prior to transport, the National Cargo Bureau, Inc. must have evaluated the system used to support and restrain the package on the barge, and must have certified that the support and tie-down system and the package stowage are in accordance with the regulations of the Commandant, United States Coast Guard.

8. Prior to transport, the United States Coast Guard must have inspected the condition of the vessel and the stowage of the package on the barge.

9. This certificate authorizes a one-time shipment for one package from the Trojan Nuclear Plant to a point near Richland, Washington.

10. The package authorized by this certificate must be transported on a conveyance assigned for the sole use of the licensee.

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

12. Expiration date: June 30, 2000.

REFERENCES

Portland General Electric Company application dated January 23, 1995.

Supplement dated: May 2, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Lass R. Chappell

Lass R. Chappell, Section Leader
Cask Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date June 29, 1995

NRC FORM 618
(9-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9263	0	USA/9263/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 December 27, 1994, as supplemented.

c. DOCKET NUMBER 71-9263

4. CONDITIONS

This certificate 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-150

(2) Description

A welded titanium encased, uranium shielded, radiographic exposure device. Primary components consist of an outer titanium shell, internal supports, depleted uranium shield, and a titanium or zircalloy S-tube. The contents are securely positioned in the S-tube by a source cable, lock assembly and source safety plug assembly. The unit resembles a rectangular box approximately 5.4 inches wide, 5.6 inches high and 14.5 inches long. The maximum weight of the package is 53 pounds.

(3) Drawings

The packaging is constructed and assembled in accordance with Source Production and Equipment Company, Inc. Drawing Nos. 15B000, Rev. 3; 15B001-3, Rev. 0; 15B002A, Rev. 3; and 15B008, 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

150 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".

Page 2 - Certificate No. 9263 - Revision No. 0 - Docket No. 71-9263

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 safety plug assembly, lock cap 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 locking ball of the source assembly must engage the locking device. The flexible cable of the source assembly and safety plug assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The 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, as supplemented, and

   (b) Each packaging must meet the Acceptance Tests and Maintenance Program in Section 8 of the application, as supplemented.

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: April 30, 2000.

REFERENCES

Source Production and Equipment Company, Inc.'s application dated December 27, 1994.

Supplements dated: January 17, March 5, and April 5, 7, 14 and 19, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: April 28, 1995

NRC FORM 618
(8-85)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9511	1	USA/9511/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)*

U. S. Department of Energy
EH-33.3
Washington, DC 20545

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U. S. Department of Energy
application dated February 26, 1991,
as supplemented

c. DOCKET NUMBER

71-9511

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No: BUSS B-1

(2) Description

The packaging is a cylindrical, forged stainless steel cask. The cask body is a one-piece forging, 54.25 inches OD by 49 inches high. The cask cavity is 20.25 inches in diameter by 23 inches high. A solid, stainless steel basket, 19.95 inches in diameter by 22.83 inches high, seats in the cask cavity. The basket has either four, six, twelve, or sixteen 2.375-inch diameter holes that serve as receptacles for the source capsules. Eleven 4-inch high, circumferential fins surround the cask body exterior. A covered vent port and a covered drain port are located on the side of the cask body. The cask lid is a one-piece forging, 28.78 inches in diameter by 12.84 inches thick. Twelve 1.5-inch diameter bolts fasten the cask lid to the cask body through a 3.8-inch thick flange. The cask lid and port covers each have concentric, double O-rings. The inner O-ring is metallic and retains the helium coolant which fills the cask cavity. The outer O-ring is elastomeric and provides an annular test volume for leak testing the metallic O-ring. The cask has an impact limiter on each end. The impact limiter is polyurethane foam in a stainless steel shroud.

The overall dimensions of the packaging with impact limiters are 84.7 inches in diameter by 107 inches high. The maximum total weight of the contents is 400 pounds. The maximum weight of the package, including contents, is 30,000 pounds. The shipping skid and personnel barrier, which are not part of the package, weigh an additional 3,700 pounds.

(a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following drawings:

Drawing No.	Title
S54773, Sht. 1, Rev. B	Cask with Impact Limiters
S48981, Sht. 1, Rev. H	Cask Assembly
T73684, Sht. 1, Rev. N, and Sht. 2, Rev. M	Body, Cask, 304 (BUSS)
R44382, Sht. 1, Rev.	Alternate Detail N for Upper Port of Unit 1, Heat No. 82V65-1-1
T73693, Sht. 1, Rev. M	Cask Lid (BUSS) 304 SST
S66574, Sht. 1, Rev. B	Bolt, Tension, 12 Point External Wrenching , Flanged
T99946, Sht. 1, Rev. E	Seal, Helicoflex, Cask Lid (BUSS)
T73685, Sht. 1, Rev. E	Plug, Drain (BUSS)
T999[illegible], Sht. 1, Rev. D	Seal, Helicoflex, Drain Plug (BUSS)
R44676, Sht. 1, Rev. A	Core Plug Assembly, Cask Body
R43728, Sht. 1, Rev. A	Core Plug, Cask Body
S48[illegible]9, Shts. 1 and 2, Rev. G, Sht. 3, Rev. [illegible]	Impact Limiter BUSS
R44381, Sht. 1, Rev. D, and Sht. 2, Rev. A	Impact Limiter BUSS, Non Conformance
S50032, Sht. 1, Rev. D	Cradle - BUSS Cask
S52600, Shts. 1 and 2, Rev. D	Pallet
S52608, Sht. 1, Rev. G	Block, Mounting
S50052, Sht. 1, Rev. F	Basket, Cask Body, 4 Hole (BUSS)
S50053, Sht. 1, Rev. E	Basket, Cask Body, 6 Hole (BUSS)
S50054, Sht. 1, Rev. D	Basket, Cask Body, 12 Hole (BUSS)
S50055, Sht. 1, Rev. E	Basket, Cask Body, 16 Hole (BUSS)

(b) Contents

(1) Type and form of material

Melt-cast cesium chloride (CsCl) or pressed-filled strontium fluoride (SrF_2) capsules meeting the requirements of special form radioactive material. The capsules are as described in supplement dated February 28, 1992.

(2) Maximum quantity of material per package

Basket Type	Capsule Type	Maximum Capsule Thermal Power (Watts)	Maximum Cask Thermal Power (Watts)	Maximum Cask Activity (million Ci)
16-Hole	CsCl	250	4000	0.85
12-Hole	CsCl	333	4000	0.85
6-Hole	SrF_2	650	3900	0.65
4-Hole	SrF_2	850	3400	0.56

For shipments of CsCl capsules, the shipment period must be completed within thirty (30) days following the placement of the cask lid on the cask body.

7. The lifting lugs must not be used as tie-downs, and the lifting lug holes must be plugged or covered during transit.

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

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

   (b) Each package shall be acceptance tested and maintained in accordance with Chapter 8 of the application, as supplemented.

9. The package authorized by this certificate must be transported on a conveyance assigned for the exclusive use of this package.

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: July 31, 1997

REFERENCES

U. S. Department of Energy application dated February 28, 1991.

plements dated February 28, 1992, and May 6, and August 26, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: SEP 28 1994

NRC FORM 618
(9-83)
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
9781	5	USA/9781/B( )F	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging 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-160 Shipping Container dated October 18, 1968, as supplemented.

c. DOCKET NUMBER 71-9781

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: M-160

(2) Description

The packaging is a right circular cylinder, 79 inches in diameter by 199 inches overall height. The packaging outer shell consists of 84 evenly spaced vertical fins 151-1/2 inches long, attached to a 1-1/2-inch thick wall (fabricated from carbon steel and clad with stainless steel on the outer surface). The inner shell, the containment vessel, is 1-inch thick (having a 1/8-inch thick rollbonded stainless steel cladding) whose base is 7 inches thick. The 9-7/16-inch annulus between the outer and inner shells is filled with lead. The top of the container is covered with a rotatable closure head fabricated of stainless steel 15 inches thick which is bolted to the container and seals the containment vessel. An oblong access plug in the cover allows for individual spent fuel cell loading or unloading.

The containment vessel has an inside diameter of 55 inches. The central region contains a secondary heat exchanger which is supported by the closure head. (This heat exchanger is not used during shipment.) An inner backup cylinder, 21 inches in diameter, occupies the central region of the containment vessel. The annulus between the backup cylinder and of the containment vessel shell provides a space 17 inches wide by 160 inches high for spent fuel. The spent fuel is contained in the annulus by aluminum module holders designed for the particular spent fuel to be shipped.

The packaging has external penetrations to the containment vessel for a steam and water vent line, which is capped during shipment. Shipments are by rail. The packaging is cradled in a support which permits the packaging to be nearly horizontal during shipment. The maximum loaded shipping weight is 237,000 pounds.

Page 2 - Certificate No. 9781 - Revision No. 5 - Docket No. 71-9781

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the description and Drawing Nos. contained in the Bettis Atomic Power Laboratory Safety Analysis Reports (WAPD-OP(R)C-243, WAPD-OP(R)C-558 and WAPD-OP(R)C-621 dated May 1973, October 1, 1976 and March 1977.

(b) Contents

(1) Type and form of material

Irradiated fuel assemblies and blanket modules of the following type:

(i) PWR Core 2 Seed 1 Fuel Assembly.
(ii) PWR Core 2 Seed 2 Fuel Assembly.
(iii) PWR Core 2 Blanket Fuel Assembly.
(iv) S5G Fuel Module, rodded or unrodded.
(v) S5G Center Cell.

All shipments shall be made dry and shall use one holddown device per PWR module. Each PWR Core 2 Seed 1 or Seed 2 Fuel assembly shall contain a poison rod or a control rod.

(2) Maximum quantity of material per package

(i) 12 fuel assemblies as described in 5(b)(1)(i) or 11 fuel assemblies and one specific blanket fuel assembly, Serial No. G2A-W01-67. Shipment shall not be made prior to 1,614 days after last power operation of the fuel and shall not exceed 12,846 Btu/hr of decay heat per shipment.

(ii) 12 fuel assemblies as described in 5(b)(1)(ii) which shall not exceed 1,100 Btu/hr per fuel assembly of decay heat or 13,200 Btu/hr per shipment.

(iii) 12 blanket fuel assemblies as described in 5(b)(1)(iii) which shall not exceed 21,300 Btu/hr of decay heat per shipment. Shipment shall not be made prior to 1,123 days after last power operation of the fuel.

(b) Contents (continued)

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

(iv) 8 fuel assemblies as described in 5(b)(1)(ii) and 4 specific blanket fuel assemblies, Serial Numbers G2A-F01-26B, G2A-F01-02, G2A-F01-10 and G2A-W01-73, which shall not exceed 12,016 Btu/hr of decay heat per shipment. Shipment shall not be made prior to 1,487 days after last power operation of the fuel, with the four blanket fuel assemblies located adjacent to each other in a clockwise or counter-clockwise direction as specified by the serial numbers previously stated.

(v) 4 fuel assemblies as described in 5(b)(1)(iv) or 3 fuel assemblies and one center cell as described in 5(b)(1)(v). Shipment shall not be made prior to 168 days after last power operation of the fuel rod and shall not exceed 12,800 Btu/hr of decay heat per shipment.

(c) Fissile Class III

Maximum number of packages per shipment One (1)

6. Expiration date: July 31, 1997.

REFERENCES

Safety Analysis Report for M-160 Shipping Container: Core Independent Analyses, SRSD-106, dated October 18, 1968, as transmitted by Naval Reactors Letter G#2097, dated June 3, 1969.

Supplements: Knolls Atomic Power Laboratory letter OKP-74520-414, dated November 26, 1969; Naval Reactors letter G#3742, dated May 15, 1973; Bettis Atomic Power Laboratory letters WAPD-OP(R)C-284, dated August 23, 1973 and WAPD-OP(R)C-297, dated October 8, 1973; Naval Reactor letters G#5582, dated December 17, 1976; G#5671, dated April 15, 1977; G#5702, dated May 23, 1977; G#5792, dated September 22, 1977; G#5793, dated September 29, 1977; G#5872, dated December 20, 1977; G#5897, dated January 11, 1978; G#6658, dated April 14, 1980, and G#92-03424, Dated March 20, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: APR 30 1992

NRC FORM 618
(9-83)
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
9786	3	USA/9786/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)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

S3G Core Basket Disposal Container
Safety Analysis Report for Packaging
dated June 1980, as supplemented

c. DOCKET NUMBER 71-9786

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: S3G Core Basket Disposal Container Assembly

(2) Description

The package consists of either one irradiated S3G, S1C or S7G core basket packaged in an inner, lead-filled container (S5W Core Basket Removal Container (CBRC)) which is placed inside an outer container (S3G Core Basket Disposal Container (CBDC)). The package weighs approximately 172,000 pounds.

The S3G CBDC is a 4-inch thick steel cylinder, 89 inches in outside diameter, 131 inches long, with an 8-inch thick top end plate and a 5-inch thick bottom end plate. Both end plates are welded to the cylinder with full penetration welds.

The S5W CBRC, which will be disposed of along with the outer S3G CBDC and inner core basket, is basically a cylindrical shaped container comprised of lead shielding sandwiched between two 304 stainless steel shells. The 1-inch thick inner shell is 60 inches O.D. and 107.5 inches long. The outer shell is made up of two geometries, a 72.5-inch O.D., 0.5-inch thick cylindrical shell that measures 66 inches long and joins a truncated conical shell which has a 64-inch O.D. at the small end. The two shells are joined by a full thickness penetration weld and a weld backup strap on the inside shell surface. Full penetration welds are also made on both ends of the shells to the top canning and shield ring.

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

The S5W CBRC will contain either an S3G, S1C or S7G core basket. The irradiated S3G core basket is an Inconel 600 cylindrical shell. Three, 3-inch thick 304 stainless steel plates are positioned in the core basket prior to removal to provide overhead radiation shielding. The lower plate is 46.2 inches in diameter. The upper plates have the same diameter but contain six extensions that fit inside recessed cutouts within the core basket. The total core basket weight is approximately 9,650 pounds.

The S1C core basket is a 304 stainless steel cylindrical shell positioned inside a 304 stainless steel thermal shield. The overhead shielding consists of a set of 2-inch thick 304 stainless steel plates attached to the S1C core basket to provide radiation shielding during handling. The core basket weight is approximately 8,523 pounds.

The S7G core basket is an Inconel 600 cylindrical shell. A 304 stainless steel laminated plate (8-inches thick) with lifting attachments is attached to the top of the S7G CB to provide radiation shielding during handling. The core basket weight is approximately 8,873 pounds.

The package may alternatively consist of S8G irradiated components positioned within an irradiated components discharge rack (ICDR) which is placed in an S3G CBDC. The ICDR is a steel rack approximately 128 inches high and 80 inches in diameter, and is designed to fit inside the S3G CBDC. The ICDR consists of a center cylinder assembly surrounded by 23 storage tubes, a top plate and a cylinder support base. The center cylinder is HY-80 steel, has a 36-inch outer diameter and a 4.5-inch wall thickness, and is 117 inches high. There are 9 storage tubes positioned inside the center cylinder. The total weight of the irradiated components, the ICDR, and the S3G CBDC is approximately 125,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Bettis Drawing No. 1527E40 for the S3G Core Basket Assembly and KAPL Drawing No. 152D7009 for the S1C Core Basket Assembly and KAPL Drawing No. 232B4874 for the S7G Core Basket Assembly and KAPL Drawing No. 978E644 for the S8G Irradiated Components.

(b) Contents

(1) Type and form of material

(i) An irradiated core basket either the S3G, S1C or S7G and S5W CBRC. The shipment may include surface contamination in the form of activated corrosion products and for the S3G core basket approximately 8 gallons of residual water.

(ii) S8G irradiated components within an ICDR. The shipment may include surface contamination in the form of activated corrosion products.

(2) Quantity of material in package

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

One irradiated core basket and S5W CBRC as described in 5(b)(1). Surface contamination not to exceed 20.6 curies for the S3G core basket, 7.45 curies for the S1C core basket or 1.2 curies for the S7G core basket. The activation level of the irradiated S3G core basket is not to exceed 131,000 curies; the irradiated S1C core basket not to exceed 20,000 curies, and the activation level of the irradiated S7G core basket is not to exceed 140,000 curies.

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

Irradiated components, including 141 instrument lines, 18 lower control drive mechanism assemblies, 4 fill sleeves, and 1 instrument stalk. Surface contamination not to exceed 65.5 curies. Activation level of the irradiated components not to exceed 2,440 curies.

6. Shipment of an irradiated S3G core basket must be made no earlier than 75 days after reactor shutdown.

7. Shipment of an irradiated S1C core basket must be made no earlier than 60 days after reactor shutdown.

. Shipment of an irradiated S7G core basket must be made no earlier than 180 days after reactor shutdown.

9. Shipment of S8G irradiated components must be made no earlier that 100 days after reactor shutdown.

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

(a) Each packaging must meet the following Acceptance Tests and Maintenance Program:

S3G Core Basket

Section 8.0 of application dated June 1980

S1C Core Basket

Section 8.0 of application dated August 1983

S7G Core Basket

Section 8.0 of application dated May 1987

S8G Irradiated Components

Section 8.0 of application dated September 1991

CONDITIONS *(continued)*

(b) The package shall be prepared for shipment and operated in accordance with the following operating procedures:

S3G Core Basket

Section 7.0 of application dated June 1980

S1C Core Basket

Section 7.0 of application dated August 1983

S7G Core Basket

Section 7.0 of application dated May 1987

S8G Irradiated Components

Section 7.0 of application dated September 1991

10. Expiration Date: August 31, 1996.

REFERENCES

S3G Core Basket Disposal Container Safety Analysis Report for Packaging, WAPD-REO(C)-122, dated June 1980, as revised (Revision 2, dated May 5, 1986).

Safety Analysis Report for Packaging an S1C Core Basket-Thermal Shield Assembly in the S3G Core Basket Disposal Container, S1C CB-TS, dated August 1983.

S7G Core Basket in the S3G Core Basket Disposal Container Safety Analysis Report for Packaging dated May 1987.

S8G Irradiated Components in the S3G Core Basket Disposal Container Safety Analysis Report for Packaging, Revision 2, dated September 1991.

DOE memorandums G#7627 dated November 16, 1983; G#C86-3736 dated May 24, 1986; G#C86-3750 dated July 15, 1986; G#87-5663 dated July 7, 1987; G#91-10937 dated July 31, 1991; G#C91-11007 dated September 18, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

NOV 19 1991

Date: _____

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
9787	2	USA/9787/B(U)F	1	3

PREAMBLE

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

A1W-3 Power Unit Shipping Container
Safety Analysis Report for Packaging
dated August 1980, as supplemented.

c. DOCKET NUMBER 71-9787

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: A1W-3 Power Unit Shipping Container (PUSC)

(2) Description

The package is a right circular cylindrical steel weldment. A module support device, a puncture protection cover, and an energy absorber are attached to the top end of the package. The module support device is secured to the power unit adapter flange with two 3-inch diameter shipping studs and is bolted to the upper clamp and cradle assembly with forty 2.25-inch diameter assembly studs. Module support cylinders (with locking nuts) and control rod holddown devices prevent fuel module or control rod motion. The top puncture protection cover, with 4-inch thick steel side walls and a 5-inch thick steel top plate, fits down over the eggcrate assembly and attaches to the bottom plate of the model support device with forty 2-inch diameter bolts. The top energy absorber, with an 80-inch outer diameter, a 54-inch inner diameter, and a height of 25 inches is welded to the top puncture protection cover.

At the bottom end of the A1W-3 PUSC, a 4-inch thick steel puncture protection plate with a diameter of 50.5 inches is attached to the bottom of the power unit thermal shield by eight sets of U-bolts. A bottom energy absorber, with an 89.25-inch outer diameter, a 52.5-inch inner diameter, and a height of 36 inches cover the bottom puncture protection plate and is attached to the thermal shield of the power unit with twelve 0.875-inch diameter bolts. The support barrel, which is part of the power unit assembly, and a stainless steel plug/band assembly, which extends around the outside of the support barrel, provide puncture protection for the sides of the power unit.

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

For shipment, the loaded A1W-3 PUSC is secured horizontally in a shipping pedestal. The shipping pedestal consists of a base on which two support beams are mounted horizontally with rubber shock mounts. The base is bolted to the deck of a 300-ton railcar and to four stop blocks which are welded to the railcar deck. The PUSC is secured to the shipping pedestal using the upper clamp and cradle assembly and the center and lower yoke/saddle assemblies. The yokes span across the upper side of the PUSC and are attached to the support beams while the saddles suspend from the yokes and support the weight of the loaded PUSC. A 0.25-inch thick railcar cover is used to enclose the entire A1W-3 PUSC for shipment.

The loaded A1W-3 PUSC (excluding the shipping pedestal) is 349 inches long, has a maximum diameter of 134 inches, and weighs approximately 397,000 pounds.

(3) Drawings

The package is constructed in accordance with the drawings, figures and sketches included in the application documents (see References, below).

(b) Contents

One unirradiated A1W-3 power unit assembly.

(c) Fissile Class III

6. Control rods and control rod holddown devices must be installed in the power unit as described in the application.

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 of the application.

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

8. Expiration date: April 30, 2000

REFERENCES

A1W-3 Power Unit Shipping Container Safety Analysis Report for Packaging, WAPD-REO(c)-118, dated August 1980.

Supplements: A1W-3 Power Unit Shipping Container Modified Top Energy Absorber Revised Safety Analysis Report for Packaging, Attachment 1 to WAPD-REO(c)-118, dated February 1985; and Naval Reactors Memorandum G#94-03572 dated November 4, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

for

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

Date: DEC 05 1994

NRC FORM 618
(8-86)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9788	7	USA/9788/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)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Deactivated S5W Reactor Compartment Safety Analysis Report for packaging dated July 1981, as supplemented.

c. DOCKET NUMBER 71-9788

4. CONDITIONS

This 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.: S2C Reactor Compartment, S3W Reactor Compartment, S4W Reactor Compartment, and S5W Reactor Compartment

(2) Description

The package consists of a deactivated and defueled S2C, S3W, S4W, or S5W Reactor Compartment which has been separated from the remainder of the submarine hull and prepared for shipment by sealing all openings and attaching handling fixtures. For each package model, the reactor compartment itself is between two containment bulkheads which are added to the package before shipping. The ship's hull and the containment bulkheads define the package containment boundaries. There is an overhang of the hull structure beyond the bulkheads at both ends of the package. The strength of all package boundary closures is equivalent to the strength of the ship's bulkheads. The deactivated reactor plant remains in place within the reactor compartment during shipment. The plant is defueled and drained except for small inaccessible pockets of liquid, primarily water. Potentially radioactively contaminated components and piping from other locations in the ship may be placed within the package and secured.

The S2C package is approximately 42 feet long and roughly cylindrical with a maximum diameter of approximately 23 feet. In addition, the S2C package has a concrete-filled tank exterior to the hull at the top of the package. New containment bulkheads made of HS steel are added at each end of the package. The hull is constructed of HY-80 steel. The maximum weight of the S2C package is 1,344,000 pounds.

The S3W Reactor Compartment package is between 46 and 48 feet long and approximately cylindrical with a maximum diameter of approximately 25 feet. The S3W package has a concrete-filled tank exterior to the hull at the top of the package. The containment bulkhead may include existing ship structure which has been sealed to form a watertight bulkhead. The hull is constructed of HT steel and the containment bulkheads are HT or HS steel. The maximum weight of the S3W package is 1,588,000 pounds.

5. (a) (2) Description (Cont'd)

The S4W Reactor Compartment package is approximately 45-1/2 feet long and approximately cylindrical with a maximum diameter of approximately 25 feet. In addition, the S4W package has a concrete-filled tank exterior to the hull at the top of the package. The containment bulkhead may include existing ship structure which has been sealed to form a watertight bulkhead. The hull is constructed of HT steel and the containment bulkheads are HT or HS steel. The maximum weight of the S4W package is 1,801,000 pounds.

The S5W Reactor Compartment package is between 35 and 45 feet long and approximately cylindrical with a maximum diameter of approximately 33 feet. The forward containment bulkhead may include existing ship structure which has been sealed to form a watertight bulkhead. The hull is constructed of HY-80 steel and the containment bulkheads are HT, HS or HY-80 steel. The maximum weight of the S5W package is 2,160,000 pounds for the 598 and 585 classes and is 2,262,400 pounds for all other classes.

(3) Drawings

The package is constructed in accordance with the drawings, figures, and sketches included in the application as supplemented (see References, below).

(b) Contents

Activated structural components associated with the S2C, S3W, S4W, or S5W reactor vessel complex, plant piping, ion exchanger resin (S5W package only), and other miscellaneous components contaminated with radioactive corrosion products (crud). As much as 230 gallons of residual liquid, primarily water, some of which contains low level radioactivity, may also be present in the package.

Ion exchanger resins with up to 3 curies of Co-60 may be shipped in the S5W package.

6. The aft containment bulkheads and stiffeners, horizontal divider plate, and any structure between the pressure hull and the outer non-pressure hull must be recessed at least 7.0 inches from the aft end of the S5W package, or at least 15.0 inches from the aft end of the S2C, S3W and S4W packages. The forward containment bulkhead and stiffeners, existing tank stiffeners, deck structure, and horizontal girder must be recessed at least 15.0 inches from the forward end of the S2C, S3W, S4W, and S5W packages.

7. The Lowest Service Temperature (LST) must be determined for each package. The package shall not be shipped unless its LST is less than or equal to the normal daily minimum temperature expected during the shipment of the package as determined on the basis of weather forecasts.

8. For S5W ships with a maximum of 3.1 curies of Co-60 on the ion exchanger resin at the time of shipment, the shipment shall not occur before 365 days after the final reactor shutdown. For S5W ships with fewer curies of Co-60 on the ion exchanger resin at the time of shipment, the minimum waiting period may vary between 185 and 365 days. For S3W and S4W ships, the shipment shall not occur before 6 years and 10 months after the final reactor shutdown. For the S2C ship, the shipment shall not occur before 9 years and 3.25 months after the final reactor shutdown.

9. Additional shielding may be provided on the exterior of the package by steel plates securely welded to the package surface so as to remain in place under the hypothetical accident conditions in 10 CFR Part 71.

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.

    (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.

11. Expiration date: December 31, 1997

Deactivated S5W Reactor Compartment Safety Analysis Report for Packaging, WAPD-REO(C)-250, dated July 1990.

Supplements: Naval Reactors Memorandum Z#C90-14, [illegible] dated March 29, 1990 and supplement dated July 6, 1990; Naval Reactors Memorandum Z#C90-14456 dated August 30, 1990; Naval Reactors Memorandum Z#C92-14438 dated August 3, 1992; Naval Reactors Memorandum Z#C93-00069 dated October 14, 1993; and Naval Reactors Memorandum Z#95-00113 dated March 16, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

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

Date: June 23, 1995

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
9789	1	USA/9789/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)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Packaging for the A1W-3 Core Barrel and Thermal Shield Disposal Container dated April 1982, as supplemented.

c. DOCKET NUMBER 71-9789

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: A1W-3 Core Barrel and Thermal Shield Disposal Container

(2) Description

The A1W-3 Core Barrel and Thermal Shield Disposal Container (A1W-3 CB/TS DC) is an upright closed cylinder consisting of a 6-inch thick cylinder body, a 12-inch thick bottom plate (at the center line), and a 12-inch thick top cover (at the center line). Both end plates are welded to the cylinder body during loaded shipment. The container is constructed of ASTM A737 steel and has an overall height of 185 inches (from bottom of crushing ring to top of lifting lugs). Both the support flange and the side crushing ring which extend from the container cylinder body have an outside diameter of 122 inches. Additional shielding is provided around the container cylinder by an upper and lower annular shield plate.

The A1W-3 CB/TS DC is used for shipment and disposal of irradiated and contaminated A1W-3 components. Maximum weight of the package is approximately 243,000 pounds.

(3) Drawings

The container general assembly is shown in Westinghouse drawings 1573E43, 1573E40, and 1573E49. The packaging is constructed in accordance with the description and drawings contained in Bettis Atomic Power Laboratory Safety Analysis Report dated April, 1982.

(b) Contents

(1) Type and form of material

Irradiated Core Barrel, Thermal Shield Assembly (inner and outer thermal shields), thermal shielded shock ring (for shipboard shipments), and irradiated Thermal Shield Lower Plate Plug with up to 12 gallons of water and surface contamination in the form of activated corrosion products.

(2) Maximum quantity of material per package

The maximum quantity of radioactive material contents (crud and activation) shall not exceed those quantities specified in Section 1.2.3.1 of the Safety Analysis Report.

6. Shipments shall not be made prior to 180 days after final reactor shutdown for shipboard components or 2-1/2 years after final reactor shutdown for prototype components.

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

(a) The container top closure (top plate-to-cylinder) weld shall be performed in accordance with Westinghouse drawings 1573E43 and 2031D77.

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

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

8. Expiration date: May 31, 2000

REFERENCES

Safety Analysis for the A1W-3 Core Barrel and Thermal Shield Disposal Container, WAPD-REO(c)-302, dated April, 1982.

Supplements: Naval Reactors memorandums G#7486 dated May 12, 1983, G#C89-2829 dated April 19, 1989, and G#94-03572 dated November 4, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

for

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

Date: DEC 05 1994

NRC FORM 618
(9-86)
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
9790	1	USA/9790/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)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Packaging for the A1W-3 Holddown/Support Barrel and Shroud Disposal Container dated November 30, 1982, as supplemented.

c. DOCKET NUMBER 71-9790

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: A1W-3 Holddown/Support Barrel and Shroud Disposal Container (A1W-3 HD/SB & SDC)

(2) Description

The A1W-3 HD/SB & SDC is a closed HY-80 steel cylindrical container consisting of an 8.00 inch thick bottom plate (at its centerline), an 8.00 inch thick top cover (at its centerline) and a cylinder of four inch wall thickness. Pads are provided on the inside wall of the cylinder and on the inside surface of the bottom plate to aid in positioning the container contents. Four thin-walled rectangular support posts which are welded to the bottom plate pads maintain the holddown barrel assembly at a height of approximately 33 inches above the bottom plate. The outside diameter of the cylinder is 105 inches, the top cover diameter is 112.50 inches, and the diameter of the bottom plate is 121 inches. Additional shielding is provided at the lower portion of the cylinder by a 28 inch high by 3.5 inch thick annular shield plate. The overall height of the container, including the lifting lugs, mounted on its railcar pad is 137.12 inches above the railcar deck. Total weight of the package is 160,000 pounds.

(3) Drawings

The container general assembly is shown on Westinghouse drawing 1526E20. The packaging is constructed in accordance with the description and drawings contained in Bettis Atomic Power Laboratory Safety Analysis Report dated November 30, 1982.

(b) Contents

(1) Type and form of material

Irradiated holddown barrel, support barrel and shrouds.

(2) Maximum quantity of material per package

The maximum quantity of radioactive material contents (crud and activation) shall not exceed the quantities specified in Tables 1.2.3-1, and 1.2.3-2, in the Safety Analysis Report.

6. Shipment shall not be made prior to 180 days after final reactor shutdown for shipboard components, or 2-1/2 years after final reactor shutdown for prototype components.

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

(a) The container top closure (top plate-to-cylinder) weld shall be performed in accordance with Westinghouse Drawing 2015D93.

(b) Each package must be prepared for shipment and operated in accordance with the procedures described in Chapter 7.0, "Operating Procedures", of the application.

(c) 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.

8. Expiration date: May 31, 2000.

REFERENCES

Safety Analysis Report for the A1W-3 Holddown/Support Barrel and Shroud Disposal Container, WAPD-REO(c)-448, dated November 30, 1982.

Supplements: Naval Reactors Memorandum G#7444 dated March 31, 1983; G#C89-2829 dated April 19, 1989; and G#94-03572 dated November 4, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

for

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

DEC 05 1994

Date: _____

NRC FORM 618
(8-89)
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
9791	3	USA/9791/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)*

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

PWR-2 Lower Core Barrel Safety Analysis Report for Packaging dated January 1982, as supplemented

c. DOCKET NUMBER 71-9791

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: PWR-2 Lower Core Barrel Shipping and Disposal Container

(2) Description

The package consists of an irradiated PWR-2 lower core barrel (LCB) and irradiated LWBR components (non-fuel) or an S8G prototype core basket assembly, packaged in an inner disposal container, which is placed inside an outer shipping container. The package weighs approximately 400,000 pounds.

The outer container is a 4-inch thick steel cylinder, 127 inches in outside diameter, 212 inches long, with two 6-inch thick end plates. The bottom end plate is welded to the cylinder with a full penetration weld and the top end plate is bolted with 107, 2-inch diameter fasteners.

The package is equipped with two 2.5-inch thick by 10-inch long circumferential impact limiter rings on the side, two concentric impact limiter rings on the ends, and aluminum honeycomb crush blocks in the top and bottom spaces between the inner and outer containers.

The container is supported horizontally on the railroad car by eight gussets attached to two horizontal plates. Each plate is bolted to the top flange of an I-beam. The bottom flange of the I-beam is bolted to a 300-ton railroad car.

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

The inner disposal container is one of the following designs:

(i) For the PWR-2 LCB and the irradiated LWBR components, the inner container is a cylinder with two steel shells containing lead in between. The inner container is 117 inches O.D. and 181 inches long. The inner steel shell is 1.0-inch thick and the outer steel is 0.5-inch thick. There are 4.25 inches of lead shielding between the shells. The inner container is supported radially in the outer container by two rings, one at each end, which have a radial clearance of 0.25 inches. The inner container is centered axially in the outer container by the aluminum honeycomb crush blocks. The bottom end of the inner container is a 4.5-inch thick plate. The top end of the inner container is an 8-inch thick plate attached to the cylinder with 40 one-inch diameter fasteners. A spiral-wound, graphite filled gasket is located between the bolted cover and the cylinder. The gasket is preloaded by the 40 bolts, which have an applied torque of 700 ft-lb. The inner container is made primarily from HY-80 steel, except for the lead shielding and the top cover, which are made from ASTM A-588.

(ii) For the S8G prototype core basket assembly, the inner container is a cylinder with an OD of approximately 117 inches, and an overall length of 174.4 inches, constructed of 304 stainless steel. The container wall is 5.5 inches thick, with a 4-inch thick bottom plate, and a 13.6 inch thick cover plate. The cover is attached to the container with a seal weld. An 8-inch wide, 3-inch thick guide ring is provided 25 inches above the container bottom plate to provide a close fit between the inner container and the irradiated cargo. A 12-inch wide, 1-inch thick ring is welded to the outside of the inner container near the top of the container to establish a close fit with the outer container. The inner container is centered axially in the outer container by the aluminum honeycomb crush blocks.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Drawing Nos. 1575E12 and 1574E96, and General Electric Drawing Nos. 977E709 and 977E467.

CONDITIONS *(continued)*

(b) Contents

(1) Type and form of material

(i) An irradiated PWR-2 lower core barrel and the following LWBR irradiated contents: (a) six blanket support tubes, (b) 11 seed support shaft assemblies, (c) seven sectioned flux thimbles, and (d) five sectioned BIF supply tubes. In addition, the shipment may include approximately 33 gallons of residual water and surface contamination in the form of activated corrosion products.

(ii) An irradiated S8G prototype core basket assembly, including core basket-thermal shield and six surveillance trains. In addition, shipment may include approximately 8 gallons of residual water and surface contamination in the form of activated corrosion products.

(2) Quantity of material in package

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

One irradiated lower core barrel assembly and irradiated LWBR structurals as described in 5(b)(1)(i). Surface contamination not to exceed 18.9 curies. The irradiated lower core barrel and LWBR structurals not to exceed 32,000 curies.

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

One irradiated S8G prototype core basket assembly, as described in 5(b)(1)(ii). Surface contamination not to exceed 148 curies. The irradiated components not to exceed 29,900 curies.

6. The package will be operated in accordance with the procedures described in Chapter 7 of the application and Naval Reactors letter G#84-452 dated March 28, 1984, or in accordance with Naval Reactors letter G#C92-03331 dated January 29, 1992. The package will be tested and maintained in accordance with the procedures in Chapter 8 of the application.

7. Expiration date: December 31, 1997.

CONDITIONS *(continued)*

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REFERENCES

PWR-2 Lower Core Barrel Safety Analysis Report for Packaging, WAPD-LP(CES)CS-670 dated January 1982.

Supplements: Naval Reactors letters G#7241 dated December 2, 1982, G#84-452 dated March 28, 1984, G#C92-03331 dated January 29, 1992, G#92-03546 dated June 5, 1992, and G#92-03589 dated July 2, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: AUG 07 1992

NRC FORM 618
(8-89)
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
9792	2	USA/9792/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*)

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

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Department of Energy application dated April 22, 1991.

c. DOCKET NUMBER 71-9792

4. CONDITIONS

This certificate 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 1 D1G Core Basket-Thermal Shield Shipping and Storage Container

(2) Description

The Model 1 D1G Core Basket-Thermal Shield (CB-TS) Shipping and Storage Container is a right circular cylinder approximately 115 inches in diameter and either 209 inches long or 216 inches long, with access for loading provided by a removable closure head. The container, consisting of the cylindrical side walls and the bottom end, has a three layer construction with a steel inner vessel approximately nine inches thick covered with approximately nine inches of reinforced concrete which is encased by a 3/8-inch thick outer shell. The CB-TS is secured in place inside the container with an 8-inch thick steel preload ring which is bolted to the inner vessel with 72 high strength bolts.

Closure of the containment vessel is provided by the 6-inch thick steel closure head which is fastened to the inner vessel with 72 high strength bolts. A steel closure ring is welded over the bolts and provides containment. A carbon steel inner impact limiter is welded to the top end of the closure ring. A wood outer impact limiter is bolted to the top plate of the container outer shell.

The shipping con'ainer is transported with its axis horizontal and is supported by a snipping skid. The loaded container weighs up to 185 tons.

5. (a) Packaging (Continued)

   (3) Drawings

   The packaging is constructed in accordance with the General Electric Company Drawings contained in Appendix 2.10.4 of the application.

   (b) Contents

   One irradiated D1G core basket-thermal shield assembly, and not more than one core's worth of irradiated D1G support assemblies, D1G lower control rod drive mechanisms, and D1G upper support assemblies; surface contamination in the form of activated corrosion products; and not more than 3.5 gallons of residual water.

6. a. Preloading of the preload plate and the closure head and sealing the container must be done with a temperature at or above +40°F.

   b. Shipment shall be made when the average daily temperature is above +40°F.

   c. Shipment shall be made no sooner than 150 days after shutdown of the reactor.

7. The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7.0 of the application, and each packaging shall be tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8.0 of the application.

8. Expiration Date: September 30, 1997.

REFERENCES

Department of Energy, Division of Naval Reactors, application dated April 22, 1991.

Supplement dated: Naval Reactors Letter G#92-03668, dated August 27, 1992.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Date: SEP 11 1992

NRC FORM 618
(9-88)
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
9793	4	USA/9793/B(U)F	1	6

PREAMBLE

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

"Core Independent M-140 Safety Analysis Report for Packaging" and "S3G-3 Recoverable Irradiated Fuel in the M-140 Safety Analysis Report for Packaging" transmitted February 27, 1991, as supplemented.

c. DOCKET NUMBER 71-9793

4. CONDITIONS

This certificate 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-140

(2) Description

A stainless steel cask for transporting recoverable irradiated fuel modules. The cask is a right circular cylinder and is transported in the upright position. The package has approximate dimensions and weights as follows:

Cavity diameter	70 inches
Cavity height	146 inches
Body outer diameter	98 inches
Body steel wall thickness	14 inches
Package overall outer diameter	126 inches
Package overall height	192 inches
Packaging weight, including standard internals	315,000 pounds
Maximum package weight including contents	375,000 pounds

The cask body is made from 304 stainless steel forgings. The cask walls are 14 inches thick and the bottom plate is 12 inches thick. The cask body flange provides a seating surface for the closure head and its protective dome. The flange contains 36 wedge assemblies located radially around the inside diameter. Retention of the closure head is achieved by engaging the wedges in a tapered groove in the circumferential edge of the closure head. The cask body has 180 external cooling fins welded to the exterior wall. A support ring is welded to the external cooling fins at a point above the center of gravity. The support ring seats on and is bolted to the rail car mounting ring during transport. The cask bottom is equipped with an energy absorber which is composed of five concentric stainless steel rings varying in thickness and height.

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

The closure head is made from forged 304 stainless steel, and is approximately 13 inches thick and 81.7 inches in diameter. The closure head is equipped with an access port, which is approximately 24 inches in diameter, and is offset from the center of the closure head. The access port plug is a stepped design with a maximum diameter of approximately 31 inches and is attached to the closure head by 24 bolts. The closure head and access port are sealed with double ethylene propylene O-ring seals. Seal test ports are provided for the closure head and access port seals. A stainless steel protective dome is positioned over the closure head and is secured to the cask body flange by 12, 1.38-inch diameter, 38.5-inch long studs installed in a vertical direction and 6, 2.5-inch diameter, 9-inch long shear bolts installed in the radial direction.

The containment system is composed of the cask body, the closure head and the closure head access port plug. There are five penetrations in the containment system: a drain port and vent port in the closure head, and a thermocouple penetration, a water inlet penetration, and a water outlet penetration in the cask body. Each penetration is sealed with a plug and a double ethylene propylene O-ring seal, and is equipped with a leak test port.

The fuel modules are positioned in an internals assembly. The internals assembly is composed of stacked internal spacer plates which have openings for the fuel modules. The internals assembly has a top plate or top plate subassembly which is preloaded by springs against a retaining ring fitted in a groove in the cask cavity wall. The internals assembly may be a standard internals assembly or an optional internals assembly.

(3) Drawings

The packaging is constructed and assembled in accordance with the Westinghouse Electric Corporation Drawings in Appendix 1.3.2 of the application.

(b) Contents

(1) Type and form of material

Recoverable irradiated fuel modules, limited to the following types, including associated activated corrosion products:

(i) S3G-3 recoverable irradiated fuel modules.

(ii) S8G recoverable irradiated fuel modules.

(iii) D1G Core 2 recoverable irradiated fuel modules.

(iv) D2W recoverable irradiated fuel modules.

5.(b) Contents (continued)

(2) Maximum quantity of material per package

Total package weight, including fuel modules and internals assembly, not to exceed 375,000 pounds; and

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

S3G-3 recoverable irradiated fuel modules, not to exceed 62,300 Btu/hr decay heat per package.

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

S8G recoverable irradiated fuel modules, not to exceed 51,609 Btu/hr decay heat per package (prototype modules), or 45,713 Btu/hr decay heat per package (shipboard modules).

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

D1G core 2 recoverable irradiated fuel modules, not to exceed 37,750 Btu/hr decay heat per package.

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

D2W recoverable irradiated fuel modules, not to exceed 63,000 Btu/hr decay heat per package for prototype core fuel modules, 53,000 Btu/hr decay heat per package for shipboard Type 3 core fuel modules, or 45,000 Btu/hr decay heat per package for shipboard Type 5 core fuel modules.

(c) Fissile Class

Maximum number of packages per shipment	One

6. For S3G-3 recoverable irradiated fuel shipments:

   (a) Only a full load is authorized. A minimum of twelve fuel modules must have either control rods or poison shipping rods. All rodded and unrodded modules must be positioned as specified on page 6-11 (Rev. 1) of "S3G-3 Recoverable Irradiated Fuel in the M-140 Safety Analysis Report for Packaging."

   (b) Minimum fuel cooling time is 130 days after shutdown.

   (c) Core age must be at least 4,000 logging corrected full power hours.

   (d) Control rod hold-down devices must be installed on cells which have control rods.

   (e) All cells must have top and bottom energy absorbers.

   (f) The weight of the fuel modules must be limited as specified on page 1-23 (Rev. 2) of "S3G-3 Recoverable Irradiated Fuel in the M-140 Safety Analysis Report for Packaging."

   (g) S3G-3 internals assembly must be used for shipment of S3G-3 fuel modules.

7. For S8G recoverable irradiated fuel shipments:

   (a) Only a full load is authorized. Full and partial fuel modules may be shipped in any combination. All full and partial fuel modules must have control rods.

   (b) Minimum fuel cooling time is 248 days after shutdown for prototype modules, and 157 days after shutdown for shipboard modules.

   (c) All fuel modules must have lower supports and grapple adapters.

   (d) Standard internals assembly must be used for shipment of S8G fuel modules. Full fuel modules must have two full (side) spacers, partial fuel modules must have two full (side) spacers and one partial (inside) spacer.

   (e) The weight of the fuel modules must be limited as specified on page 1.23 (Rev. 4) of "S8G Recoverable Irradiated Fuel in the M-140 Safety Analysis Report for Packaging."

8. For D1G Core 2 recoverable irradiated fuel shipments:

   (a) Up to eight fuel modules may be shipped per package. Fuel modules of different types may be shipped in any combination.

   (b) Minimum fuel cooling time is 181 days after shutdown.

   (c) All normally rodded fuel modules must have control rods. Control rod holddown devices must be installed on rodded modules.

   (d) Rodded modules must have top and bottom energy absorbers. Unrodded modules must have top energy absorbers.

   (e) Standard internals assembly must be used for shipment of D1G Core 2 fuel modules. Fuel module cavity spacers must be used for all fuel modules.

9. For D2W recoverable irradiated fuel shipments:

   (a) Up to eight fuel modules may be shipped per package. Fuel modules of different types may be shipped in any combination. Up to nine fuel modules may be shipped per package, provided that one of the fuel modules is the prototype removable fuel assembly (RFA).

   (b) Minimum fuel cooling time is 180 days after shutdown.

   (c) All normally rodded fuel modules must have control rods. Control rod holddown devices must be installed on all rodded modules. The universal grapple adapters serve as the rod holddown devices.

   (d) The standard internals assembly must be used for shipment of D2W fuel modules. All fuel modules must be shipped with the appropriate cell spacers, as shown in Appendix 1.4 of the application dated October 14, 1994.

10. The package must contain no more than 6 gallons of residual water, except that shipments of D2W recoverable irradiated fuel may contain up to 11 gallons of residual water.

11. Failed fuel, or fuel with defective cladding is not authorized for shipment.

12. Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application, except:

    All containment seals, including the main closure head seal, must be replaced with new seals within the 12-month period prior to each shipment, or earlier if inspection shows any defect.

13. The package must be prepared for transport and operated in accordance with Chapter 7 of the application, except:

    The containment seals, excluding the main closure head seal, must pass a leak test after final closure prior to each shipment. The leak test must have a sensitivity of at least 1×10^{-3} std-cm^3/sec.

14. Prior to first use, and within the 12-month period prior to each shipment, all containment seals, including the main closure head seal, must be leak tested to show a leak rate no greater than 1×10^{-4} std-cm^3/sec. The leak test must have a sensitivity of at least 5×10^{-5} std-cm^3/sec.

15. Expiration date: October 31, 1996.

REFERENCES

"Core Independent M-140 Safety Analysis Report For Packaging," and "S3G-3 Recoverable Irradiated Fuel in the M-140 Safety Analysis Report For Packaging," transmitted February 27, 1991.

Supplements dated: May 21, June 21, and July 17, 1991; February 4 and 7, August 17, and December 2, 1992; and October 14, 1994.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Carl R. Chappell

Carl R. Chappell, Section Leader
Cask Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: SEP 0 3 1995

NRC FORM 618
(9-95)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

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9794	0	USA/9794/B(U)	1	2

REAMBLE

a. This certificate is issued to certify that the packaging 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 Packaging for CGN Reactor Compartment Disposal," dated July 12, 1994, as supplemented

c. DOCKET NUMBER 71-9794

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: CGN 25/35 Reactor Compartment Disposal Package

(2) Description

The package consists of one deactivated and defueled CGN Reactor Compartment that has been separated from the remainder of the cruiser hull and prepared for shipment by enclosing the entire reactor compartment within a welded steel container. The package is approximately cylindrical, and is about 37 feet high and about 31 feet in diameter. The entire package is a sixteen-sided polyhedron with an enlarged base containing support fixtures, which extend approximately 10 feet beyond the diameter of the package and provide lift points for the package. The container is constructed of high strength steel (MIL-S-22698). The reactor compartment components are contained of water, except for small inaccessible pockets. The maximum weight of the package is 2,780,000 pounds. Potentially radioactive contaminated components and piping from areas outside the reactor compartment may be secured within the package.

(3) Drawing

The packaging is constructed in accordance with the drawings in Appendix 1.3 of the application.

(b) Contents

(1) Type and form of material

Activated structural components associated with the CGN 25/35 reactor compartments, plant piping, purification media (which may be removed or left installed), and other components contaminated with radioactive corrosion products (crud). A maximum of 750 gallons of residual liquid, primarily water, some of which contains low level radioactivity may also be present in the package.

5. (b) Contents (continued)

(2) Maximum quantity of material per package

The maximum quantity of radioactive material contents (crud and activation) shall not exceed the quantities specified in Section 1.2.3.1 of the application.

6. The shipment shall be no earlier than 365 day after shutdown.

7. The Lowest Service Temperature (LST) must be determined for each package. The package shall not be shipped unless its LST is less than or equal to the daily minimum temperature expected during shipment of the package, as determined on the basis of weather forecasts.

8. The radioactivity of the ion exchanger resin may be no more than the value listed in Table 4.1 of the application.

9. The reactor vessel shall have been operated for less than 28,530 effective full power hours.

10. In addition to the requirements of Subpart [illegible] 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 in accordance with Chapter 8 of the application.

11. Expiration date: September 30, 2010

REFERENCES

"Safety Analysis Report for Packaging for CGN Reactor Compartment Disposal," dated July 12, 1994.

Supplements Dated: November 10, 1994; and July 14, 1995.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: SEP 25 1995

NRC FORM 618
(9-83)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
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1.a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9853	9	USA/9853/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)

U.S. Department of Energy
EH-33
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for Packaging: The Unirradiated Fuel Shipping Container, USA/9853/AF ORNL/TM-11994, dated October 28, 1991.

c. DOCKET NUMBER 71-9853

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: HFBR Unirradiated Fuel Shipping Container

(2) Description

A right cylindrical stainless steel drum enclosing a fuel basket provided with seven (7) cavities. Five (5) of the seven (7) cavities are blocked to prevent their use. The outer shell and lid are fabricated from 11-gauge steel and the base is 1/4" thick plate. The outer lid is held in place by six (6), 5/8" bolts and nuts. The basket shell is fabricated from 16-gauge stainless steel. The basket top and bottom plates are 11-gauge stainless steel. Eight (8), 3/8" bolts and nuts retain the basket lid (0.125" thick aluminum) in place.

The basket is supported on 2" by 6" timbers inside the outer shell. The remaining space around the basket is filled with phenolic foam insulation.

The package has dimensions and weight as follows:

Outside dimension, in	24-1/2
Container length, in	75-1/2
Base, in	29 x 29
Inside cavity cross section, in	4 x 4
Gross weight, lb	590

CONDITIONS *(continued)*

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with the following ORNL Drawing Nos.:

M-11518-OH-001-E, Rev. 0,
M-11518-OH-002-E, Rev. 0 and
M-11518-OH-003-D, Rev. 0.

(b) Contents

(1) Type and form of material

Unirradiated uranium fuel elements as U_3O_8-Al cermet enriched up to 95 w/o in the U-235 isotope, and clad in aluminum at least 10 mils thick.

The contents are described in the Babcock & Wilcox Company Drawing Nos. 4-8002-D, Rev. F, and 9-8025-E, Rev. M, as modified by Brookhaven National Laboratory letter dated October 17, 1991 (Chapter 1, Appendix B, of the application).

(2) Maximum quantity of material per package

Two (2) fuel elements containing up to 355 grams U-235 per fuel element.

(c) Fissile Class III

Maximum number of packages per shipment one (1)

6. The fire resistant phenolic foam shall be in accordance with AEC Materials and Equipment Specification SP-9 or as modified by ORGDP Report K/TL-729.

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 Chapter 7.0 of the application; and

(b) The package must meet the Acceptance Tests and Maintenance Program in Chapter 8.0 of the application.

CONDITIONS *(continued)*

8. Fabrication of additional packagings is not authorized.

9. Expiration date: October 31, 1996.

REFERENCES

Safety Analysis Report for Packaging: The Unirradiated Fuel Shipping Container USA/9853/AF ORNL/TM-11994, October 28, 1991.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: DEC 3 1 1991

NRC FORM 618
(6-89)
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
9932	3	USA/9932/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)

University of California
Lawrence Livermore Laboratory
P.O. Box 808
Livermore, CA 94550

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report on Model UC-609 Shipping Package, Report No. UCRL-52424, August 1977

c. DOCKET NUMBER 71-9932

4. CONDITIONS

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

5.

(a) Packaging

(1) Model No.: UC-609

(2) Description

Packaging for large quantities of tritium. The containment vessel is 1/8-inch thick 316 stainless steel, 18-inches in diameter by 44 inches long. An aluminum tube forms a 10-inch diameter by 31-inch long containment cavity. The space between the stainless steel outer shell and the aluminum tube is filled with aluminum honeycomb. Access to the containment cavity is through a 10-inch diameter opening at one end. Positive closure of the flanged stainless steel cover plate is accomplished using eight (8), 3/8-inch alloy steel bolts. The cover closure is sealed with an inner copper gasket and outer Viton O-ring seal. A valved port between these gaskets is provided for leak testing. A manifold containing a valve and 200 psig pressure gage is welded to the center of the cover plate. The containment vessel is centered and supported within a 16-gauge steel drum 25 inches in diameter by 54-1/2 inches high using Celotex insulation. The package gross weight is 500 pounds.

Page 2 - Certificate No. 9932 - Revision No. 3 - Docket No. 71-9932

(3) Drawings

The packaging is constructed in accordance with Lawrence Livermore Laboratory Drawing Nos.: AAA76-109771-0C, AAA75-113967-0B, AAA75-113083-0A, AAA77-102165-00, AAA75-112930-0A, AAA77-104161-00, AAA77-104165-0A and AAA77-104163-0B.

(b) Contents

(1) Type and form of material

Tritium in any form held within secondary containers.

(2) Maximum quantity of material per package

Decay heat not to exceed 48 watts. Not more than 25 gm-moles (150 grams) of tritium.

6. The initial pressure within the containment vessel and secondary containers shall be such that if all gases were released from the secondary containers the maximum pressure within the containment vessel, at 20°C (68°F) would not exceed:

(i) 84 psig when no water is present, or

(ii) 45 psig when water is present.

7. The weight of the secondary containers shall not exceed a total of 120 pounds.

8 Acceptance tests and maintenance shall be in accordance with Section 8.0 of Lawrence Livermore Laboratory Report No. UCRL-52424, August 1977.

9. Operating procedures equivalent to those specified in Section 7.0 of Lawrence Livermore Laboratory Report No. UCRL-52424, August 1977, shall be established for use.

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: November 30, 1995.

REFERENCES

Lawrence Livermore Laboratory Report No. UCRL-52424, August 1977.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards
and Transportation, NMSS

Date: NOV 2 9 1980

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: BYPROD. NORM. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
CI-20WC-2	USA/9098/B( )	02/28/1998
CI-20WC-2A	USA/9098/B( )	02/28/1998
GE-8500	USA/6697/B( )	09/30/1996
PAS-1	USA/9184/B(U)	07/31/1999
PAS-2	USA/9181/B(U)	08/31/1995
PAS-2A	USA/9181/B(U)	08/31/1995
UC-609	USA/9932/B( )	11/30/1995

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: BYPROD. SPEC. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
A-0109	USA/6280/B( )	01/31/2000
AI 500 SU	USA/9006/B(U)	08/31/1996
AI 520	USA/9007/B(U)	12/31/1995
BUSS R-1	USA/9511/B(U)	07/31/1997
C-1	USA/9036/B(U)	10/31/2000
C-8	USA/9128/B(U)	02/28/1996
E-MEH-00-00004	USA/9011/B( )	08/31/1996
GE-500	USA/9049/B( )	12/31/1995
IR-100	USA/9157/B(U)	01/31/1998
IR-50	USA/9156/B(U)	01/31/1998
LCG-25A	USA/4888/B( )	12/31/1996
LCG-25B	USA/4888/B( )	12/31/1996
LCG-25C	USA/4888/B( )	12/31/1996
MW-3000	USA/9030/B( )	10/31/1995
NATICK IRRADI	USA/5362/B( )	01/31/2000
NPI-20WC-6	USA/9102/B( )	10/31/1998
NPI-20WC-6 MKII	USA/9215/B(U)	10/31/1997
OP-100	USA/9185/B(U)	01/31/1998
ORNL TRU CALIF	USA/5740/B( )	06/30/1996
SENTINEL-100F	USA/5862/B( )	09/30/1995
SENTINEL-25A	USA/4888/B( )	12/31/1996
SENTINEL-25B	USA/4888/B( )	12/31/1996
SENTINEL-25C	USA/4888/B( )	12/31/1996
SENTINEL-25C3	USA/4888/B( )	12/31/1996

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: BYPROD. SPEC. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
SENTINEL-25D	USA/4888/B( )	12/31/1996
SENTINEL-25E	USA/4888/B( )	12/31/1996
SENTINEL-25F	USA/4888/B( )	12/31/1996
SENTINEL-8	USA/9030/B( )	10/31/1995
SNAP-21	USA/5830/B( )	11/30/1995
SPEC 2-T	USA/9056/B(U)	12/31/1999
SPEC-150	USA/9263/B(U)	04/30/2000
URIPS-8A	USA/6786/B( )F	04/30/1998
URIPS-8B	USA/6786/B( )F	04/30/1998
100	USA/9127/B(U)	10/31/1999
100A	USA/9127/B(U)	10/31/1999
181361	USA/5796/B(U)	07/31/1997
181375	USA/5796/B(U)	07/31/1997
20	USA/9126/B(U)	10/31/1999
20A	USA/9126/B(U)	10/31/1999
200	USA/9127/B(U)	10/31/1999
200A	USA/9127/B(U)	10/31/1999
3206B	USA/9167/B(U)	12/31/1998
3218	USA/9167/B(U)	12/31/1998
3227B	USA/9167/B(U)	12/31/1998
4.5 TON CF	USA/6642/B( )	10/31/1996
420	USA/9245/B(U)	09/30/1997
50	USA/9126/B(U)	10/31/1999
50A	USA/9126/B(U)	10/31/1999

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: BYPROD. SPEC. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
5979	USA/5979/B( )	09/30/2000
5984	USA/5984/B( )	03/31/1995
650	USA/9032/B(U)	10/31/1999
660	USA/9033/B(U)	10/31/2000
660A	USA/9033/B(U)	10/31/2000
660AE	USA/9033/B(U)	10/31/2000
660B	USA/9033/B(U)	10/31/2000
660BE	USA/9033/B(U)	10/31/2000
660E	USA/9033/B(U)	10/31/2000
6717-B	USA/6717/B(U)	09/30/1998
676	USA/9029/B(U)	10/31/1999
676A	USA/9029/B(U)	10/31/1999
676AE	USA/9029/B(U)	10/31/1999
676B	USA/9029/B(U)	10/31/1999
676BE	USA/9029/B(U)	10/31/1999
676E	USA/9029/B(U)	10/31/1999
680	USA/9035/B(U)	04/30/2000
680A	USA/9035/B(U)	04/30/2000
680AE	USA/9035/B(U)	04/30/2000
680B	USA/9035/B(U)	04/30/2000
680BE	USA/9035/B(U)	04/30/2000
680E	USA/9035/B(U)	04/30/2000
683	USA/9053/B(U)	11/30/1995
684	USA/9028/B(U)	01/31/1996

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: BYPROD. SPEC. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
684A	USA/9028/B(U)	01/31/1996
684AE	USA/9028/B(U)	01/31/1996
684B	USA/9028/B(U)	01/31/1996
684BE	USA/9028/B(U)	01/31/1996
684E	USA/9028/B(U)	01/31/1996
702	USA/6613/B(U)	03/31/1998
715	USA/9039/B(U)	06/30/1995
741	USA/9027/B(U)	11/30/1995
741A	USA/9027/B(U)	11/30/1995
741AE	USA/9027/B(U)	11/30/1995
741B	USA/9027/B(U)	11/30/1995
741BE	USA/9027/B(U)	11/30/1995
741E	USA/9027/B(U)	11/30/1995
770	USA/9148/B(U)	03/31/1997
771	USA/9107/B(U)	05/31/1998
820	USA/9137/B(U)	11/30/1995
850	USA/9147/B(U)	11/30/2000
855	USA/9165/B(U)	12/31/1998
864	USA/9166/B(U)	01/31/1998
865	USA/9187/B(U)	12/31/1998
900	USA/9141/B(U)	11/30/1995
920	USA/9143/B(U)	01/31/1996

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: FISSILE URANIUM

MODEL	PACKAGE ID #	EXPIRATION DATE
ANF-250	USA/9217/AF	01/31/2000
ATR	USA/9099/B(U)F	01/31/1999
A1W-3 PUSC	USA/9787/B(U)F	04/30/2000
BU-7	USA/9019/AF	11/30/1998
BW-2901	USA/9251/AF	08/31/1997
DHTF	USA/9203/AF	01/31/1996
D2G POWER UNIT	USA/6441/B( )F	12/31/1997
FL 10-1	USA/9009/B( )F	06/30/1999
FPD-100	USA/9057/AF	09/30/1995
FSV-3	USA/6347/AF	03/31/1997
GE-21PF-1	USA/4909/AF	11/30/1999
HFBR UNIR CONT	USA/9853/AF	10/31/1996
INNER HFIR UN	USA/5797/B(U)F	10/31/1996
MCC-3	USA/9239/AF	11/30/1996
MCC-4	USA/9239/AF	11/30/1996
MCC-5	USA/9239/AF	11/30/1996
MODEL B	USA/6206/AF	09/30/2000
MODEL 1 S-6213	USA/9186/B(U)F	07/31/1997
MODEL 2 S-6213	USA/9186/B(U)F	07/31/1997
NCI-21PF-1	USA/9234/B(U)F	12/31/1998
NFS-URANYL NIT.	USA/5059/AF	08/31/1996
NNFD 5X22	USA/9250/B(U)F	01/31/1998
NNFD-10	USA/6357/AF	04/30/1996
NONE SPECIFIED	USA/6406/AF	12/31/1997

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: FISSILE URANIUM

MODEL	PACKAGE ID #	EXPIRATION DATE
OUTER HFIR UN	USA/5797/B(U)F	10/31/1996
PADUCAH TIGER	USA/6553/AF	11/30/1998
RA-2	USA/4986/AF	10/31/1997
RA-3	USA/4986/AF	10/31/1997
RCC	USA/5450/AF	09/30/1996
RCC-1	USA/5450/AF	09/30/1996
RCC-3	USA/5450/AF	09/30/1996
RCC-4	USA/5450/AF	09/30/1996
SP-1	USA/9248/AF	12/31/1998
SP-2	USA/9248/AF	12/31/1998
ST	USA/9246/AF	02/28/1997
S5W POWER UNIT	USA/5580/B( )	12/31/1997
TRIGA-I	USA/9034/AF	05/31/1995
TRIGA-II	USA/9037/AF	05/31/1995
TROJAN PRESSUR.	USA/9260/A	06/30/2000
TROJAN STEAM	USA/9259/A	06/30/2000
UNC-2600	USA/5086/B(U)F	01/31/1999
UNC-2901	USA/6294/AF	09/30/1995
UX-30	USA/9196/AF	01/31/1995
2.7 NEW FUEL	USA/5894/AF	07/31/1997
235R001	USA/6386/B(U)F	07/31/1997
51032-1	USA/6581/AF	05/31/1999
51032-2	USA/9252/AF	09/30/1998
814A	USA/5149/B( )F	06/30/2000

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: FISSILE URANIUM

MODEL	PACKAGE ID #	EXPIRATION DATE
927A1	USA/6078/B( )F	10/31/2000
927C1	USA/6078/B( )F	10/31/2000

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: IRRADIATED FUEL

MODEL	PACKAGE ID #	EXPIRATION DATE
BMI-1	USA/5957/B( )F	06/30/1996
CNS 1-13G	USA/9216/B( )F	12/31/1997
FSV-1	USA/6346/B( )F	04/30/1996
GE-100	USA/5926/B( )F	02/28/1998
IF-300	USA/9001/B( )F	09/30/2000
M-130	USA/6003/B( )F	12/31/1997
M-140	USA/9793/B(U)F	10/31/1996
M-160	USA/9781/B( )F	07/31/1997
NAC-LWT	USA/9225/B(U)F	02/28/2000
NAC-STC	USA/9235/B(U)F	09/30/1999
NLI-1/2	USA/9010/B( )F	03/31/1996
NLI-10/24	USA/9023/B( )F	03/31/1997
T-2	USA/5607/B( )F	05/31/1998
T-3	USA/9132/B(M)F	03/31/1996
TN-BRP	USA/9202/B(U)F	06/30/1999
TN-FSV	USA/9253/B(U)F	05/31/1999
TN-REG	USA/9206/B(U)F	05/31/2000
TN-8	USA/9015/B( )	05/31/1996
TN-8L	USA/9015/B( )	05/31/1996
TN-9	USA/9016/B( )F	05/31/1996
125-B	USA/9200/B(M)F	05/31/1996
2000	USA/9228/B(U)F	06/30/1999

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: LSA

MODEL	PACKAGE ID #	EXPIRATION DATE
BS-33-180	USA/6722/A	04/30/1996
CNS 14-170 III	USA/9249/A	07/31/1998
CNS 14-195-H	USA/9094/A	10/31/1995
CNS 21-300	USA/9096/A	09/30/2000
CNS 6-75	USA/9108/A	09/30/1998
CNS 6-80-2	USA/9111/A	01/31/1999
CNS 6-80-2A	USA/9111/A	01/31/1999
CNS 8-120A	USA/6601/A	02/28/1996
CNSI 14-215H A	USA/9176/A	05/31/1998
HN-100 SERIES 3	USA/9151/A	10/31/1997
HN-190-1	USA/9086/A	07/31/1998
HN-190-2	USA/9224/A	06/30/1998
HN-194S	USA/9089/A	02/28/1999
LL-60-150	USA/6568/A	03/31/1996
LN 10-135A	USA/9177/A	05/31/1998
LN 14-170 1	USA/9151/A	10/31/1997
LN 14-170H	USA/9159/A	05/31/1998
LN 14-170L	USA/9159/A	05/31/1998
LN 14-170M	USA/9159/A	05/31/1998
LN 14-195H	USA/9176/A	05/31/1998
LN 14-195L	USA/9176/A	05/31/1998
LN 6-80H	USA/9179/A	05/31/1998
LN 6-80L	USA/9179/A	05/31/1998
LN 7-100	USA/9178/A	05/31/1998

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: LSA

MODEL	PACKAGE ID #	EXPIRATION DATE
NUPAC 10/140	USA/9177/A	05/31/1998
NUPAC 14/190H	USA/9159/A	05/31/1998
NUPAC 14/190L	USA/9159/A	05/31/1998
NUPAC 14/190M	USA/9159/A	05/31/1998
NUPAC 14/210H	USA/9176/A	05/31/1998
NUPAC 14/210L	USA/9176/A	05/31/1998
NUPAC 14D-2.0	USA/9079/A	06/30/1998
NUPAC 50-1.5L	USA/9145/A	03/31/1996
NUPAC 50-2.5L	USA/9145/A	03/31/1996
NUPAC 50-3.0L	USA/9145/A	03/31/1996
NUPAC 50-4.0L	USA/9145/A	03/31/1996
NUPAC 6/100H	USA/9179/A	05/31/1998
NUPAC 6/100L	USA/9179/A	05/31/1998
NUPAC 7/100	USA/9178/A	05/31/1998
YNPS STEAM GEN.	USA/9256/A	09/30/1998
10-142A	USA/9073/A	02/28/1999
110G-A	USA/9247/A	01/31/1998
14-215	USA/9222/A	03/31/1999
40G-A	USA/9254/A	09/30/1998
589	USA/9139/A	12/31/1996

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: PU AIR

MODEL	PACKAGE ID #	EXPIRATION DATE
PAT-1	USA/0361/B(U)F	09/30/1998
PAT-2	USA/9150/B(U)	07/31/1996

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: PU NORM. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
B-3	USA/6058/B( )	12/31/1995
BETTIS WASTE	USA/6142/B( )	12/31/1997
NRBK-41	USA/9221/B( )F	01/31/1996
TRUPACT-II	USA/9218/B(U)F	06/30/1999
WAPD-40	USA/5874/B( )F	07/31/1997
6400	USA/6400/B( )F	06/30/1997

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: PU SPEC. FORM

MODEL	PACKAGE ID #	EXPIRATION DATE
BCL-2	USA/9068/B( )F	05/31/1997
BCL-3	USA/9067/B( )F	05/31/1997
BCL-4	USA/5950/B( )F	08/31/1996
MO-1	USA/9069/B( )	01/31/1997
S5W REFUEL.SRCE	USA/5757/B( )F	12/31/1997
1500	USA/5939/B( )F	12/31/1997

U.S. NUCLEAR REGULATORY COMMISSION
LIST OF PACKAGES BY PACKAGE TYPE
10/01/1995

TYPE OF PACKAGING: WASTE, B

MODEL	PACKAGE ID #	EXPIRATION DATE
AP-101	USA/9071/B( )	12/31/1996
A1W-3 CB/TS DC	USA/9789/B(U)	05/31/2000
A1W-3 HD/SB SDC	USA/9790/B(U)	05/31/2000
CGN 25/35 RCDP	USA/9794/B(U)	09/30/2000
CNS 1-13C	USA/9081/B( )	12/31/1997
CNS 1-13C II	USA/9152/B( )F	05/31/1999
CNS 10-160B	USA/9204/B(U)	10/31/1995
CNS 3-55	USA/5805/B( )	03/31/1999
CNS 4-85	USA/6244/B( )	04/30/2000
CNS 8-120B	USA/9168/B(U)	06/30/2000
D1G CB-TS	USA/9792/B(U)	09/30/1997
N-55	USA/9070/B(U)	12/31/1999
NAC-1	USA/9183/B( )F	09/30/1999
PWR-2 CORE BAR.	USA/9791/B(U)	12/31/1997
S2C REC. COMPT.	USA/9788/B(U)	12/31/1997
S3G CBDCA	USA/9786/B(U)	08/31/1996
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S5W REC. COMPT.	USA/9788/B(U)	12/31/1997
TN-RAM	USA/9233/B(U)	01/31/2000
10-135B	USA/9210/B(U)	12/31/1999
10-142	USA/9208/B( )	06/30/1996
3-82B	USA/6574/B( )	04/30/1996

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11. ABSTRACT (200 words or less)

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

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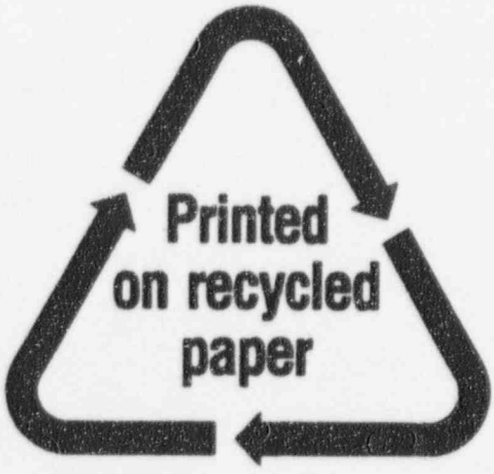

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