NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1 a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
0361	12	71-0361	USA/0361/B(U)F-96	1	OF	6

2. PREAMBLE

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

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

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

a. ISSUED TO *(Name and Address)*

National Nuclear Security Administration
P.O. Box 5400
Albuquerque, NM 87185-5400

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.

4. CONDITIONS

This certificate 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, SAR Drawing 1017) surrounded by a stainless steel and redwood overpack (designated AQ-1, SAR Drawing 1002).

- For plutonium oxide shipments, the contents are sealed within a stainless steel product can (designated PC-1, SAR Drawing 1024) inside the containment vessel.
- For plutonium metal shipments, the contents are sealed within a titanium vessel (designated T-Ampoule, SAR Addendum Drawing 2A0261) inside of 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. For oxide shipments, 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. For plutonium metal shipments the vessel is closed by 12, 1/2-inch diameter bolts and sealed with a copper gasket and knife edges only.

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. The PAT-1 with T-Ampoule configuration is limited to the current certified TB-1 gross payload weight of 2100 g (4.7 lbs).

(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 for the Plutonium Air Transportable Package, Model PAT-1*, NUREG-0361, hereafter identified as SAR, as supplemented by Issue B of Drawing Nos. 1004, 1009, 1013, 1016, 1017, 1019, 1020 and 1022 and with drawings and specifications in Section 1.0 of the *PAT-1 Safety Analysis Report Addendum*, SAND2010-6109 Revised, hereafter identified as SAR Addendum, as supplemented by Issue A of Drawings R99794, 2A0259, 2A0260, 2A0262, 2A0264, 2A0266, 2A0267, 2A0269, and 2A0385, and Issue B of Drawings 2A0263, 2A0261, 2A0265, and 2A0268.

(b) Contents

(1) Type and form of material A

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 A 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.

(3) Type and form of material

Plutonium metal (alloyed or non alloyed) in various isotopic compositions and composite (Pu and beryllium (Be) separated by a titanium layer) material. The

maximum decay heat load of the plutonium metal contents may not exceed 25 watts.

(4) Maximum quantity of material B per package and additional permissible contents:

(a) 731 to 831 gram alpha or delta phase plutonium metal hollow cylinder in T-Ampoule per package; or,
(b) 338 gram maximum plutonium metal in each of two SC-2 Sample Container (SAR Addendum Drawing 2A0265), alloyed plutonium, maximum content per package is 676 grams; or,
(c) 174 gram maximum plutonium metal in each of three SC-1 Sample Container (SAR Addendum Drawing 2A0268), alloyed plutonium, maximum per package is 522 grams; or,
(d) 60 gram maximum plutonium composite in each SC-1 or SC-2 Sample Container, 120 gram maximum for SC-2 and 180 gram maximum for SC-1 shipments.
(e) One type of plastic labeling or tagging material of those listed below per shipment not to exceed these limits:

Material Type	Quantity (gram)
Polyethylene terephthalate (such as Metalized PET, Mylar™)	6.9
Polyethylene	3.5
Polyvinyl chloride (PVC)	12.2
Polytetrafluoroethylene (PTFE, such as Teflon™)	12.5

All previous labels must be removed prior to application of new labels.

(f) Tantalum foil may be used as packing material within the T-Ampoule and SC-1 or SC-2 Sample Containers.
(g) Neutron emission from the Pu/Be source is limited to 363 n/s/cm^2.
(h) Pu/Be sources are limited to a contact surface of 91 cm^2 or less.

(c) Criticality Safety Index

Minimum transport index to be shown on label material A content package for nuclear criticality control:	0.4
Minimum transport index to be shown on label of material B content package for nuclear criticality control:	0.1

6. Prior to first use, each packaging shall meet the acceptance tests and standards specified in Subsection 8.1 and Section 9.0 of the SAR.

In addition to the packaging requirements above, for plutonium metal shipments, prior to first use, the acceptance tests and standards for the components listed in Section 1 and Subsection 8.1 of the SAR Addendum apply.

7. Prior to each shipment, the package shall meet the tests and criteria specified in Subsection 8.2 of the SAR for plutonium oxide shipments and the SAR and SAR Addendum for components specific to plutonium metal shipments.

8. The TB-1 O-ring is removed from the PAT-1 design for the plutonium metal shipment.

9. The electro-refined plutonium metal as defined by the isotopic composition in SAR Addendum Section 1.2.2 must be shipped within one year of manufacture.

10. Each TB-1 with T-Ampoule configuration shall be leak tested to leaktight prior to shipment. The leak rate tests shall be conducted in accordance with ANSI N14.5 using calibrated equipment as described in the SAR Addendum. A radiological survey must be performed on each PAT-1 package prior to shipment. Validation that the survey was performed must be communicated to the package destination and retained by the shipper as part of shipment records. Surface contamination on any accessible part of the package must not exceed the limits specified in 49 CFR 173.443, Table 9. Emanations must not exceed the limits specified in 49 CFR 173.441. Measurement equipment used for surveys must be calibrated and of sufficient accuracy.

11. For the Department of Energy, the packaging shall be designed, procured, fabricated, accepted, operated, maintained, and repaired in accordance with the Quality Assurance requirements of Chapter 9 of the SAR Addendum. For other applicants, the packaging shall be designed, procured, fabricated, accepted, operated, maintained, and repaired in accordance with an NRC approved Quality Assurance program.

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

    a. Packages containing plutonium oxide and its daughter products in any solid form or containing plutonium oxide mixed with uranium oxide and its daughter products, in any solid form shall be prepared for shipment in accordance with the operations specified in the SAR, Section 7, *Operating Procedures*.

    b. Packages containing plutonium metal shall be prepared for shipment in accordance with the operations specified in SAR Addendum, Section 7, *Package Operations*.

13. The systems and components of each packaging shall meet the periodic tests and criteria specified in Subsection 8.3 of the SAR for plutonium oxide shipments and Subsection 8.2 of the SAR Addendum for plutonium metal shipments.

14. Repair and maintenance of the packaging shall be in accordance with Sections 8.0 and 9.0 of the Safety Analysis Report and with Subsection 8.2 of the SAR Addendum.

15. For plutonium oxide shipments, the PC-1 product can and the top spacer need not be used when the contents include 20 curies or less of plutonium oxide.

16. 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) In commercial transport, 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

17. Packagings must be marked with Package Identification Number USA/0361/B(U)F-96.

18. The package authorized by this certificate is hereby approved for transportation of plutonium by air (10 CFR 71.64).

19. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

20. Expiration date: December 31, 2026.

REFERENCES

NRC FORM 618 (8-2000) 10 CFR 71			U.S. NUCLEAR REGULATORY COMMISSION		
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Safety Analysis Report for the Plutonium Air Transportable Package Model Number PAT-1, NUREG-0361, June 1978 and PAT-1 Safety Analysis Report Addendum, SAND2010-6109 Revised submitted on December 15, 2010.

Sandia Laboratories application dated February 20, 1980.

Supplements dated: July 27, 1990, July 20, 1993, September 21, 2009, September 20, 2010, November 30, 2015; and December 9, 2021.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Yoira K. Diaz-Sanabria

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Date: 2021.12.21 16:00:28 -05'00'

Yoira K. Diaz Sanabria, Chief
Storage and Transport Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: December 21, 2021