Department of Energy
Washington, DC 20585

August 25, 2017

MEMORANDUM FOR KIMBERLY DAVIS LEBAK
MANAGER
LOS ALAMOS FIELD OFFICE
NATIONAL NUCLEAR SECURITY ADMINISTRATION

FROM: JOANNE D. LORENCE
HEADQUARTERS CERTIFYING OFFICIAL
DIRECTOR
OFFICE OF PACKAGING AND TRANSPORTATION

SUBJECT: Amendment of Department of Energy Certificate of Compliance Number 9519

In response to your request to Dr. James Shuler of my staff dated December 14, 2016, as supplemented March 21, 2017, Department of Energy (DOE) Certificate of the Compliance (CoC) Number 9519, Revision 5, for the Model SAFESHIELD 2999A package is issued with its attached Safety Evaluation Report. Changes to the CoC are indicated by vertical bars in the right page margin.

This CoC is issued by DOE under the authority of 49 CFR 173.7(d) and is conditional upon fulfilling the applicable Operational and Quality requirements of 49 CFR Parts 100-199 and 10 CFR Part 71 and the conditions specified in Item 5 of the CoC.

The expiration date of the certificate is June 30, 2022.

If you have any questions, please contact me or Dr. James M. Shuler of my staff at (301) 903-5513.

Attachments

cc: Robert Murphy, NA-LA
Dave McCollum, LANL
Yung Liu, ANL
James Shuler, EM-4.24

U.S. DEPARTMENT OF **ENERGY**

DOE Packaging Certification Program

CERTIFICATE OF COMPLIANCE
For Radioactive Materials Package

DOE F 5822.1
(5-85 Formerly EV-618)

1a. Certificate Number	1b. Revision No.	1c. Package Identification No.	1d. Page No.	1e. Total No. Pages
9519	5	USA/9519/B(U)-96 (DOE)	1	8

2. PREAMBLE

2a. This certificate is issued under the authority of 49 CFR Part 173.7(d).

2b. The packaging and contents described in Item 5 below meet the safety standards set forth in subpart E, "Package Approval Standards" and subpart F, "Package , Special Form, and LSA-III Tests" Title 10, Code of Federal Regulations, Part 71.

2c. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. This certificate is issued on the basis of a safety analysis report of the package design or application —

(1) Prepared by (*Name and Address*):	(2) Title and identification of report or application:	(3) Date:
U.S. Department of Energy Los Alamos National Laboratory P.O. Box 1663 Los Alamos, NM 87545	Safety Analysis Report for Packaging SAFESHIED 2999A, Package Docket 99-7-9519, SARP 2999A, Revision 5, October 17, 2011, as supplemented [see 5.(d)]	October 2011

4. CONDITIONS
This certificate is conditional upon fulfilling of the applicable Operational and Quality Assurance requirements of 49CFR parts 100 – 199 and 10CFR Part 71, and the conditions specified in Item 5 below.

5. Description of Packaging and Authorized Contents, Model Number, Transport Index, other Conditions, and References:

(a) Packaging

(1) Model Number: SAFESHIELD 2999A

(2) Description:

The packaging consists of a shielding flask (Flask 2993) carried in an outer double skinned insulated casket (Casket 2999). The outer dimensions of the packaging are 1396 mm (54.96 inches) high by 1040 mm (40.94 inches) in diameter. The nominal weight of the packaging is 3853 kg (8494 lb), excluding contents. The maximum contents weight is 100 kg (220 lb).

The Casket 2999 consists of a double skinned low carbon steel base assembly and a double skinned low carbon steel cover assembly. The cover assembly is fastened to the base assembly with stainless steel studs and nuts. The cavities between the double skin of the base assembly and cover assembly are filled with a Thermal Insulating and Shock Absorbing Foam (TISAF), a phenolic resin foam. The cavities in the casket base assembly and cover assembly are normally sealed but will vent through the vent plugs in the outer shell during a hypothetical accident fire. The Casket 2999 is fitted with internal shock absorbing aluminum honeycomb on top of the base assembly and at the inside top of the cover assembly. The Flask 2993 stands on the aluminum honeycomb fitted on top of the base assembly.

6a. Date of Issuance: 08/25/2017	6b. Expiration Date: June 30, 2022
FOR THE U.S. DEPARTMENT OF ENERGY	
7a. Address (*of DOE Issuing Office*) U.S. Department of Energy Office of Packaging and Transportation (EM-4.24) 1000 Independence Avenue, SW Washington, DC 20585	7b. Signature, Name, and Title (*of DOE Approving Official*) Joanne D Lorence Headquarters Certifying Official Director Office of Packaging and Transportation

The Flask 2993 is fabricated as a stainless steel shell to which is fitted a stainless steel containment vessel, with the space between the containment vessel and Flask 2993 body shell filled with 4% Sb lead shielding. The Flask 2993 has an overall height of 912 mm (35.9 inches) and an overall diameter of 669 mm (26.3 inches.), and the cavity dimensions are 400 mm (15.75 inches) high by 220 mm (8.66 inches) in diameter. The radial thickness of the 4% Sb lead shielding on the flask side is nominally 213 mm (8.38 inches). The shielding in the base and top plug is slightly greater than the radial thickness.

The containment boundary for the radioactive material is the containment vessel portion of Flask 2993. The elements of the containment boundary are the cavity liner, top flange, closure flange, and the inner O-ring fitted to the flask closure. The containment vessel cavity liner and integral top flange is machined from a solid billet. The top flange is provided with grooves for two O-ring seals, and mates to the closure flange having a deep spigot that fits into the top of the top flange. The closure flange is fastened to the top flange by 16 M12 screws. Access to the space between the two ethylene propylene O-rings is provided for operational and maintenance leak testing. The containment vessel top flange is also fitted with a second leak test point which provides access for leak testing the lead filled cavity of the flask and hence the outer surface of the containment vessel of the flask.

(3) Drawings:

The packaging design is defined by the following Croft Associates Ltd. drawing lists, which in turn identify the individual design drawings:

DL-1C-4540, Sheet 1/1, Issue G	Drawing List for Packaging Design No. 2999A
DL-0C-4490, Sheet 1/3, Issue G	Drawing List for Flask Design No. 2993
DL-0C-4490, Sheet 2/3, Issue F	" "
DL-0C-4490, Sheet 3/3, Issue E	" "
DL-1C-4511, Sheet 1/3, Issue D	Drawing List for Casket GA Design No. 2999
DL-1C-4511, Sheet 2/3, Issue C	" "
DL-1C-4511, Sheet 3/3, Issue D	" "
DL-1C-7060, Sheet 1/1, Issue B	Drawing List for Target Capsule Design No. 4082

(b) Contents

(1) Type and form of material

(i) Special form sources as specified in Table 1.

(ii) Non-special form encapsulated materials as specified in Table 2.

(iii) Irradiated accelerator targets [except Low Melting Point (LMP) metal accelerator targets] as specified in Table 3.

(iv) Ion exchange canister as specified in Table 4.

(v) Radioactive waste material from handling irradiated targets as specified in Table 5.

(vi) Irradiated LMP metal accelerator targets as specified in Table 6.

TABLE 1	
General form	Radioactive material contained in capsules that meet the requirements for special form.
Physical form	Solid: metal discs or rods for Co-60 and Ir-192, pressed pellets for Cs-137.
Chemical form	Metal for Co-60 and Ir-192, chloride for Cs-137.
Number of contents items	One or more. For small sources, several hundred may be carried.
Product containers	The special form sources shall be carried in an outer carrier fitted to provide a convenient means of handling. Additional shielding may be added as required. Any additional shielding shall be designed so that its effectiveness will not be reduced under normal conditions of transport (NCT).
Decay heat limit	250 watts.
Radionuclides	Each package may contain only one of the following radionuclides: Cs-137 – 55,000 Ci maximum activity Co-60 – 16,200 Ci maximum activity Ir-192 – 43,900 Ci maximum activity

TABLE 2	
General form	Radioactive materials contained in capsules that do not meet the requirements for special form.
Physical form	Solid: metal discs or rods for Co-60 and Ir-192, pressed pellets for Cs-137.
Chemical form	Metal for Co-60 and Ir-192, chloride for Cs-137.
Number of contents items	One or more. For small sources, several hundred may be carried.
Product containers	Capsules may be welded or have a removable top (e.g., screw or bayonet fastening) and shall be designed so that they cannot open under NCT. The capsules may be carried in an outer carrier fitted to provide a convenient means of handling, and to provide further containment for the purpose of avoiding contamination of the flask cavity. Additional shielding may be added as required. Any additional shielding shall be designed so that its effectiveness will not be reduced under NCT.
Decay heat limit	250 watts.
Radionuclides	Each package may contain only one of the following radionuclides: Cs-137 – 55,000 Ci maximum activity Co-60 – 16,200 Ci maximum activity Ir-192 – 43,900 Ci maximum activity

TABLE 3	
General form	Irradiated accelerator targets (except LMP metal accelerator targets) – metal target cells containing radioactive material in solid form, either as metals, cast salts, or pressed powders.
Physical form	Solid.
Chemical form	Element or compound.
Number of contents items	One or more. Typically, three targets may be carried.
Product containers	Solid accelerator targets in metal form may not be encapsulated, but may be contained in a carrier for user convenience. Dispersible solid materials and materials that are soluble in water shall be encapsulated in target cells that are used to perform irradiation. Target cells shall be fabricated in metal, typically aluminum, stainless steel, or Inconel. The target cells may be carried in an outer carrier fitted to provide a convenient means of handling, and to provide further containment for the purpose of avoiding contamination of the flask cavity.
Decay heat limit	200 watts.
Radionuclides	For this contents type, any of the radionuclides listed in SARP Table 1.2 may be carried, provided that the other limitations above are observed. Co-60, Cs-137, and Ir-192 are prohibited. Mixtures of radionuclides shall be limited such that the sum of the proportionate amounts of each radionuclide with respect to the quantity shown in SARP Table 1.2, as supplemented by 5(d)(2) and (3) of this certificate, does not exceed unity.

TABLE 4	
General form	Ion exchange canister containing ion exchange resins with adsorbed radioactive material.
Physical form	Solid.
Chemical form	Element or compound adsorbed on ion exchange resins.
Number of contents items	One only.
Product containers	Stainless steel canister containing ion exchange resins.
Decay heat limit	10 watts.
Radionuclides	For this contents type, any of the radionuclides listed in SARP Table 1.2 may be carried, provided that the other limitations above are observed. Co-60, Cs-137, and Ir-192 are prohibited. Mixtures of radionuclides shall be limited such that the sum of the proportionate amounts of each radionuclide with respect to the quantity shown in SARP Table 1.2, as supplemented by 5(d)(2) and (3) of this certificate, does not exceed unity.

TABLE 5	
General form	Radioactive waste material from handling irradiated targets.
Physical form	Solid.
Chemical form	Element or compound as irradiated components or contaminated items.
Number of contents items	One only.
Product containers	Aluminum canister containing radioactive waste material.
Decay heat limit	10 watts.
Radionuclides	For this contents type, any of the radionuclides listed in SARP Table 1.2 may be carried, provided that the other limitations above are observed. Co-60, Cs-137, and Ir-192 are prohibited. Mixtures of radionuclides shall be limited such that the sum of the proportionate amounts of each radionuclide with respect to the quantity shown in SARP Table 1.2, as supplemented by 5(d)(2) and (3) of this certificate, does not exceed unity.

TABLE 6	
General form	Irradiated Low Melting Point (LMP) metal accelerator targets - Metal target cells containing radioactive metal that may be in liquid form under NCT temperatures.
Physical form	Metal gallium and rubidium (which may be liquid) - no water to be present.
Chemical form	Elemental.
Number of contents items	Up to 4 targets (each in its Target Cell) may be carried in a Target Capsule and 1 to 3 Target Capsules may be present in the flask cavity. Irradiated Target Cells as specified in Table 3 of this certificate may also be carried in the flask together with Target Capsules.
Product containers	LMP Metal accelerator targets shall be encapsulated in the Target Cell used to perform irradiation. Target Cells shall be fabricated in niobium for gallium metal contents and Inconel® or stainless steel for rubidium metal contents. The Target Cells will themselves have become activated during the target irradiation and contribute to the radioisotope inventory to be shipped. The Target Cells shall be carried in a Target Capsule to drawing 1C-7060 which is designed to provide additional confinement under HAC. The Target Cells may be encased in a can or other metallic packing to provide further confinement for the purpose of avoiding contamination of the Target Capsule. Dunnage shall be provided to limit the movement of the target cell(s) within the target capsule to be no more than 5 mm and to prevent Target Cells from impacting each other and to limit damage. A Target Carrier shall be used to provide a convenient means of handling. Target Capsules and Target Cells shall be packed so that they cannot move within the cavity of the flask by more than 15 mm in order to prevent the external radiation level changing due to such movement and to limit damage. No containment function is required for the Target Carrier. Periodic maintenance is required annually on the Target Capsule to ensure compliance with drawing 1C-7060 and leak test the containment with a pass criterion of 10^{-3} ref cm^3.
Decay heat limit	200 watts.
Radionuclides	Irradiated Target Cells containing metallic gallium and rubidium, and irradiated Target Cells - as specified in Table 3 of this certificate - the limits for all radionuclides are listed in Table 1.2 of the SARP, as supplemented by 5(d)(2) and (3) of this certificate. Mixtures of radionuclides shall be limited such that the sum of the proportionate amounts of each radionuclide with respect to the quantity shown in Table 1.2 of the SARP, as supplemented by 5(d)(2) and (3) of this certificate does not exceed unity.

(2) Maximum Quantity of Material Per Package: as specified in Tables 1 through 6. For the contents described in 5(b)(1)(i) through 5(b)(1)(vi), trace quantities of radionuclides are permitted up to 1% of the total activity of the contents.

(c) Conditions

(1) No water may be present for any contents. Content loading shall take place in a dry environment.

(2) The maximum weight of all material (radioactive contents, product capsules or containers, all associated items such as target holders, and packing) inside the containment vessel of Flask 2993 may not exceed 100 kg (220 lb).

(3) The shape of the contents (radioactive contents, product capsules or containers, all associated items such as target holders, and packing) inside the containment vessel of Flask 2993 shall be such as to preclude any protrusions or sharp points that could puncture the cavity liner of the containment vessel.

(4) The contents (radioactive contents, product capsules or containers, all associated items such as target holders, and packing) inside the containment vessel of Flask 2993 shall be packed such that they cannot move within the cavity of the flask [or, for the contents described in 5(b)(1)(i) and 5(b)(1)(ii), within any additional shielding] by more than 15 mm under NCT

(5) For the contents described in 5(b)(1)(i) and 5(b)(1)(ii), exclusive use shipment is required whenever the contents heat output exceeds 200 watts, the external radiation levels exceed 200 mrem/hr on the package surface, or the Transport Index exceeds 10

(6) The fuse plugs in SARP drawings 1C-4512 and 1C-4513 shall be installed using Loctite Type 270 thread sealant.

(7) The content decay heat generation rates may be determined through calculation, calorimetry, or process knowledge, and shall be recorded. This information shall be included as part of the shipping documentation.

(8) All production cavity liner units shall be machined from a solid billet of material.

(9) In addition to the requirements of Subparts G and H of 10 CFR Part 71, each package must be fabricated, acceptance tested, operated, and maintained in accordance with the Operating Procedures requirements of Chapter 7, Acceptance Tests and Maintenance Program requirements of Chapter 8, and packaging-specific Quality Assurance requirements of Chapter 9 of the SARP, as supplemented by 5.(d)(2) and 5.(d)(3) of this certificate.

(10) Revision 4 of this certificate may be used until 8/31/2018.

(11) Only DOE elements or persons working under contract to DOE elements shall consign the package for shipment.

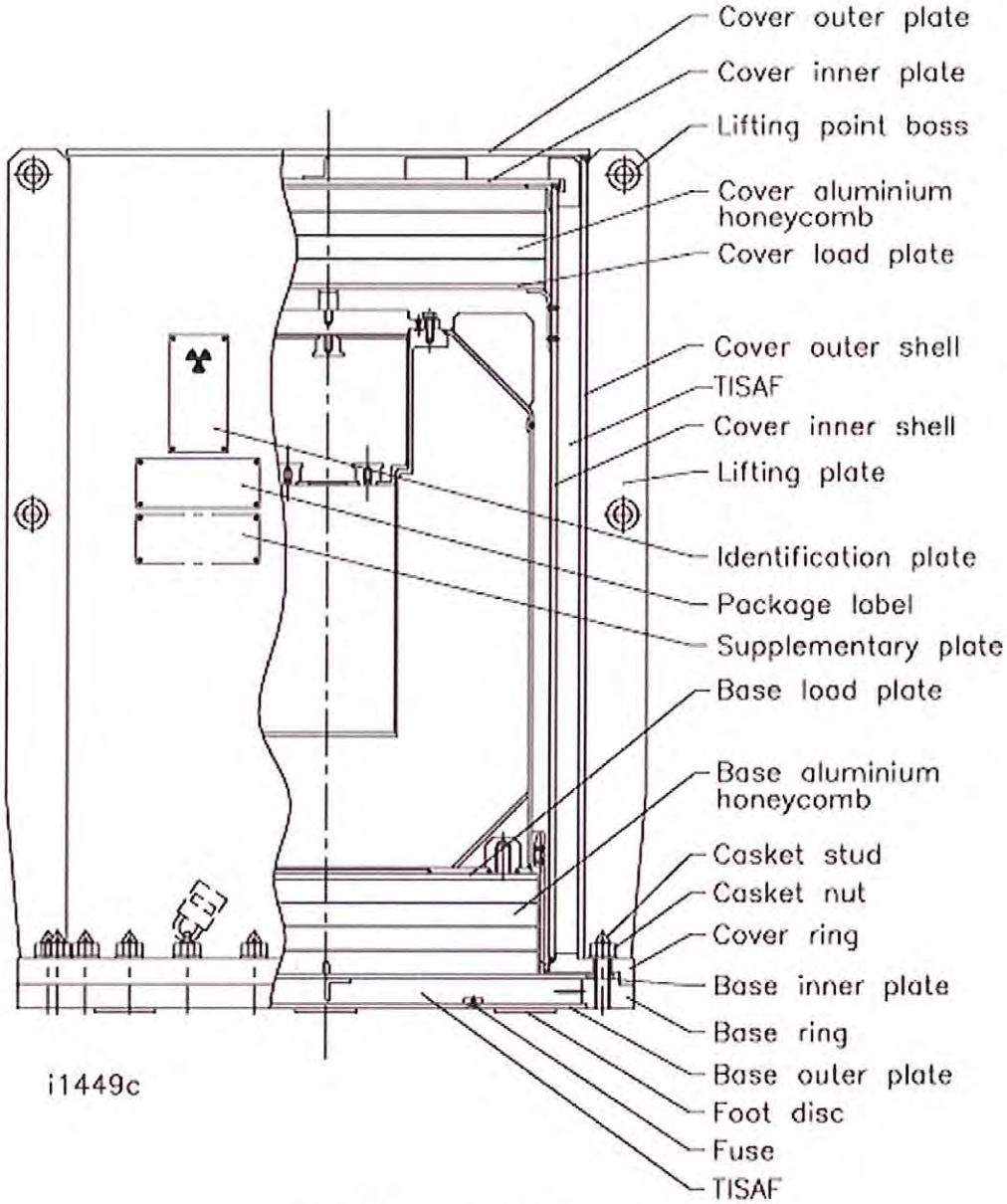
(12) Nuclear Regulatory Commission (NRC) or Agreement State licensees shall not consign a DOE certified package for shipment, but can transfer the material on-site to DOE elements or persons working under contract to DOE elements for consignment of the package.

(d) Supplements

(1) *Request for Renewal of Certificate of Compliance for SAFESHIELD 2999A*, Memorandum from Kimberly Davis Lebak to James Shuler, April 4, 2017.

(2) *Safety Analysis Report for Packaging SAFESHIELD 2999A*, Rev. 6 page changes, dated September 26, 2016.

(3) *Safety Analysis Report for Packaging SAFESHIELD 2999A*, Rev. 7 page changes, dated March 21, 2017



SAFESHIELD 2999A