



**Department of Energy**  
Washington, DC 20585

May 20, 2019

MEMORANDUM FOR MICHAEL D. BUDNEY  
MANAGER

SAVANNAH RIVER OPERATIONS OFFICE

FROM:

JOANNE D. LORENCE

A handwritten signature in cursive script, reading "Joanne D. Lorence".

HEADQUARTERS CERTIFYING OFFICIAL  
DIRECTOR

OFFICE OF PACKAGING AND TRANSPORTATION

SUBJECT:

Initial issue of Department of Energy Certificate of Compliance  
Number 9981

In response to your request dated March 9, 2018, to Dr. James Shuler, Department of Energy (DOE) Certificate of the Compliance (CoC) Number 9981, Revision 0, for the Model 9981 is issued with its attached Package Approval Record and Safety Evaluation Report.

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 April 30, 2024.

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

Attachments

cc: Maxine Maxted, SR  
Robert Watkins, SRNL  
Brian Anderson, LLNL  
James Shuler, EM-4.24



**U.S. DEPARTMENT OF ENERGY**

DOE Packaging Certification Program

**CERTIFICATE OF COMPLIANCE  
For Radioactive Materials Package**

OE F 5822.1  
5-85 Formerly EV-618)

1a. Certificate Number <b>9981</b>	1b. Revision No. <b>0</b>	1c. Package Identification No. <b>USA/9981/AF-96 (DOE)</b>	1d. Page No. <b>1</b>	1e. Total No. Pages <b>6</b>
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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): U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, SC 29808	(2) Title and identification of report or application: Safety Analysis Report for Packaging Model 9981 Type AF Shipping Package, S-SARP-G-00020, Revision 0, March 2019, as supplemented [see 5(e)]	(3) Date: March 2019

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: 9981
- (2) Description:

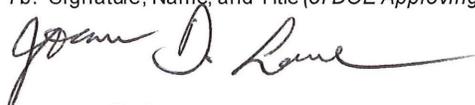
The Model 9981 is a Type AF package design for transport of fissile low enriched uranium ingots, uranium regulus called "derbies," and miscellaneous metal waste.

The packaging assembly is composed of one 55-gallon protective outer drum assembly, one 30-gallon inner confinement drum assembly, and one insulation cover assembly. The nominal weight of the packaging assembly is 267 lb.

The 55-gallon drum and its lid, fabricated from 16-gauge carbon steel, include a welded steel liner containing a polyurethane foam for thermal insulation and structural support. When installed, the lid assembly extends into the drum body liner. An ethylene propylene diene monomer gasket seals the drum closure. The 30-gallon inner drum and its lid, fabricated from 16-gauge and 18-gauge carbon steel respectively, include a welded steel liner containing a polyurethane foam for thermal insulation and structural support. The 30-gallon drum assembly is positioned centrally, both radially and axially, within the 55-gallon drum steel liner. The inner drum, which

6a. Date of Issuance: <b>05/20/2019</b>	6b. Expiration Date: <b>April 30, 2024</b>
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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
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secures the radioactive contents payload, is the containment boundary for the package. A silicon gasket seals the 30-gallon drum closure.

Reinforced split-ring devices, fabricated from 12-gauge carbon steel, provide secure closures for both the 30- and 55-gallon drums. Tamper Indicating Devices (TID) can be inserted through the lugs welded at each end of the two split-rings for both the 30- and 55-gallon drums.

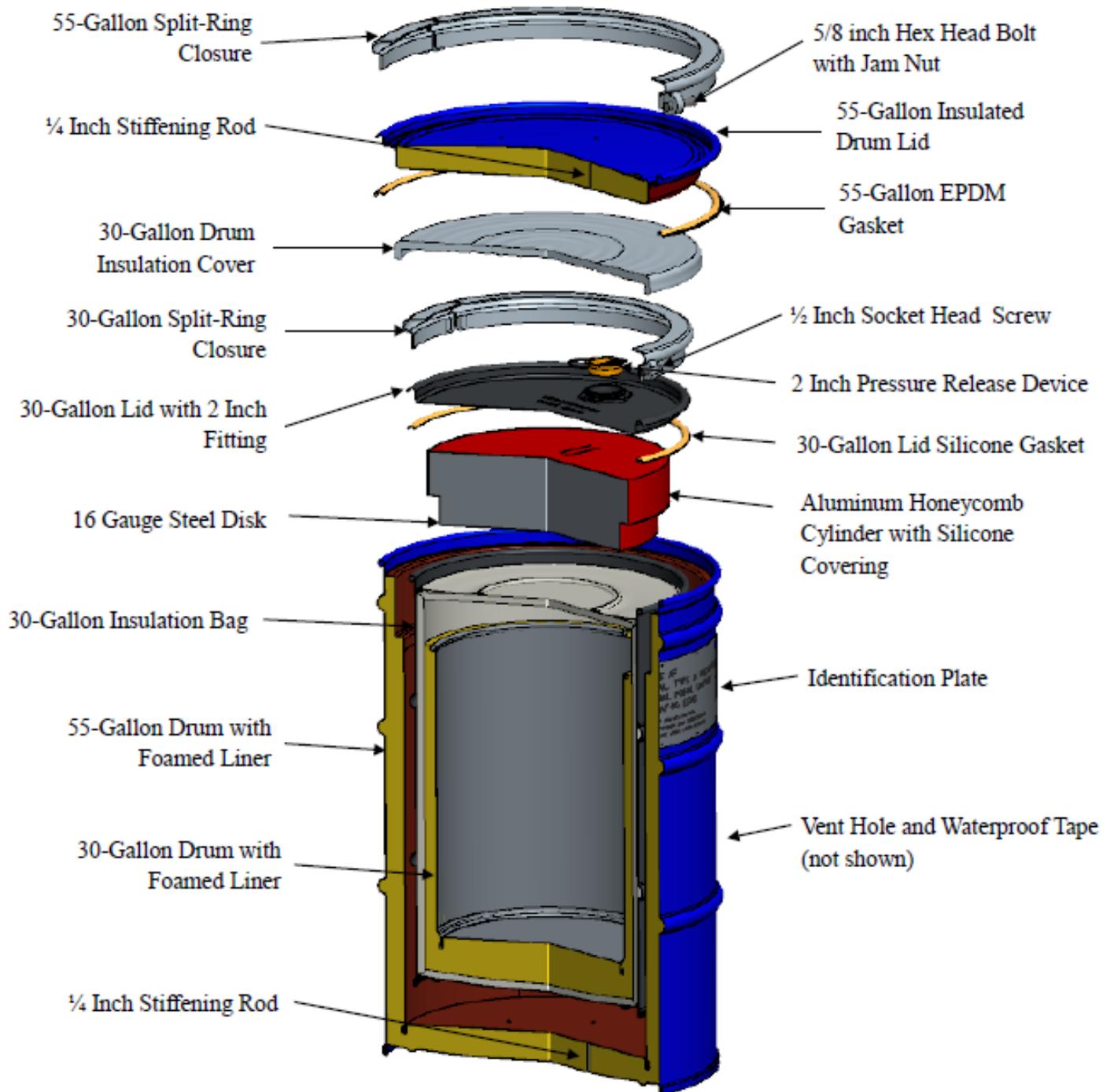
Two quilted thermal insulation components, made from ceramic fiber batting with top and backing of flexible fiberglass woven cloth, are added to the packaging: a quilted insulation cover, 21½ inches in diameter by ½ inch thick is positioned between the 30-gallon and 55-gallon drum closure lid and a quilted insulation bag is installed permanently in the 30-gallon drum between the drum inner wall and polyurethane foam. The insulation bag is cinched closed after the contents, impact absorber, and insulation bag cover (18 inches in diameter by ½ inch thick) are installed in the bag prior to closure of the 30-gallon drum.

An impact absorber, made of aluminum honeycomb, is inserted in the 30-gallon drum liner. The impact absorber sits on top of the drum body liner and extends into the liner cavity. The final usable cavity size in the 30-gallon drum liner is approximately 15 inches in diameter by 18 inches in height.

The overall dimensions of the packaging are defined by the 55-gallon drum assembly, which is nominally 25 ¾ inches in diameter and 34 ½ inches in height. The nominal weight of the outer drum assembly (body, closure lid, and split-ring closure device) is 177.4 lb. The 30-gallon drum assembly is nominally 20 ½ inches in diameter and 28 ¾ inches in height. The nominal weight of the inner drum assembly (body, closure lid, impact absorber, insulation bag cover, and split-ring closure device) is 89.3 lb. The nominal weight of the insulation cover assembly, which is positioned between the 30-gallon and 55-gallon drum closure lid, is 0.5 lb.

The gross weight of a fully loaded package shall not exceed 650 lb.

The packaging configuration is shown in Figure 1 of this certificate.



**Figure 1 - 9981 Type Packaging Configuration**

(3) Drawings:

The packaging design is defined by the following drawings.

Drawing Number	Revision Number	Title
R-R5-G-00013	1	9981 Type AF Package Tree (U)
R-R1-G-00092	0	9981 Type AF Packaging Assembly (U)
R-R1-G-00093	0	9981 Type AF 55-Gallon Drum Overpack Assembly (U)
R-R1-G-00094	0	9981 Type AF 30-Gallon Drum Assembly (U)
R-R1-G-00101	1	9981 Type AF 30-Gallon Drum Split Ring Assembly (U)
R-R2-G-00128	3	9981 Type AF 55-Gallon Drum Lid Subassembly and Weldment (U)
R-R2-G-00129	3	9981 Type AF 55-Gallon Drum Body Subassembly and Weldment (U)
R-R2-G-00130	1	9981 Type AF 30-Gallon Drum Lid Subassembly (U)
R-R2-G-00131	4	9981 Type AF 30-Gallon Drum Subassembly (U)
R-R3-G-00094	1	9981 Type AF 55-Gallon Drum Split Ring Assembly (U)
R-R4-G-00179	2	9981 Type AF 30-Gallon Drum Insert Subassembly (U)
R-R4-G-00181	0	9981 Type AF 30-Gallon Drum Lid Gasket (U)
R-R4-G-00182	0	9981 Type AF 55-Gallon Drum Identification Plate Detail (U)
R-R4-G-00183	0	9981 Type AF Package Honeycomb Subassembly (U)
R-R4-G-00186	0	9981 Type AF Package Insulation Cover Assembly (U)
R-R4-G-00187	3	9981 Type AF Package 30-Gallon Drum Liner Detail (U)
R-R4-G-00189	0	9981 Type AF Package 30-Gallon Drum Insulation Bag Assembly (U)

Note: U means unclassified

(b) Contents

(1) Type and Form of Radioactive Material:

Type A quantity of fissile low enriched uranium ingots, uranium regulus called “derbies,” and miscellaneous metal waste.

Non-radioactive contents may include secondary containers, wrapping, convenience cans, plastic bagging, polyurethane foam, polyethylene, vermiculite packing, and other dunnage material.

(2) Maximum Quantity of Radioactive Material per Package:

The radioactive material and payload mass limits for the package is defined in Table 1 of this certificate. The maximum fissile mass of U-235 is 2 kg, based on 160 kg of Uranium enriched with up to 1.25% of U-235.

**Table 1 – Low Enriched Uranium (LEU) Content Envelope**

Feature	Material	Mass (g)
Radioisotopes	Tc-99	4.00E-00
	Th-228	6.72E-09
	Th-230	3.84E-03
	Th-232	1.76E+00
	U-232	6.13E-08
	U-234	2.20E+01
	U-235	2.00E+03
	U-236	1.72E+02
	U-238 <sup>a</sup>	1.58E+05
	Np-237	6.15E-02
	Pu-238	1.22E-06
	Pu-239	5.63E-03
	Pu-241	3.41E-05
	Am-241	9.97E-07
Total Mass	Radioactive Material <sup>b</sup>	1.60E+05
	Package Payload	1.66E+05

a Includes contributions from daughter products (e.g., Th-234, etc.)

b This content was analyzed for Pu-240 and Pu-242. Results indicate their quantities are below the detection limit.

(c) Criticality Safety Index

The Criticality Safety Index CSI is 1.4

(d) Conditions

(1) The maximum allowable radioactive decay heat rate is 6 milliwatts.

(2) Three weight limits apply to the Model 9981. The gross weight of a fully loaded package shall not exceed 650 lb. (295 kg.); the mass of the radioactive material shall not exceed 160 kg (352 lb.);

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and the total payload mass (i.e., radioactive and non-radioactive contents) shall not exceed 166 kg. (365 lb.).

- (3) Pyrophoric materials, cryogenic liquids, compressed gasses, visible liquids, and chemically reactive substances are prohibited as content in the package.
- (4) Transport of fissile material by air is prohibited.
- (5) Moisture within the content payload is limited to a maximum of one weight percent.
- (6) In addition to the requirements of Subparts G and H 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 Safety Analysis Report for Packaging (SARP), as supplemented by 5.(e) of this certificate,
  - (b) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the SARP, and
  - (c) Each entity must comply with the Quality Assurance requirements of Chapter 9 of the SARP.
- (7) The following are requirements for content packing configurations:
  - (a) Sharp edged waste must be padded if shipped without handling containers.
  - (b) Handling containers must be vented and packed with closures upright.
- (8) The shipper shall replace the 2.0-mil polystyrene waterproof tape, if damaged, on the venting and fill holes on 55-gallon drum, prior to reuse of the packaging.
- (9) Only DOE or persons working under contract to DOE shall consign the package for shipment.
- (10) Nuclear Regulatory Commission or Agreement State licensees shall not consign a DOE certified package for shipment, but can transfer the material onsite to DOE or persons working under contract to DOE, for consignment of the package.

(e) Supplements

None



# **EM Environmental Management**

safety ❖ performance ❖ cleanup ❖ closure

## **DOE Packaging Certification Program**

### PACKAGE CERTIFICATION APPROVAL RECORD

Certificate of Compliance Number 9981

Package Identification No. USA/9981/AF-96 (DOE)

Model No. 9981

Docket 18-32-9981

Department of Energy (DOE) Certificate of Compliance (CoC), Certificate Number 9981, Revision 0, Package Identification No. USA/9981/AF-96 (DOE) for the Model 9981 package is issued for DOE use of the package.

This Type AF package design meets the requirements of 10 CFR Part 71, based on the *Safety Analysis Report for Packaging, Model 9981 Type AF Shipping Package, S-SARP-G-00020*, Revision 0, dated March 2019.

The expiration date for DOE Certificate Number 9981 is April 30, 2024.

This certificate constitutes authority for DOE to use the Model 9981 for offsite shipment of DOE radioactive material under 49 CFR 173.7(d).

Only DOE elements or persons working under contract to DOE elements (i.e., management and operating contractors) shall consign the package for shipment. Nuclear Regulatory Commission or Agreement State licensees shall not consign a DOE certified package for shipment, but can transfer the material onsite to DOE or persons working under contract to DOE for consignment of the package.

Joanne D. Lorence  
Headquarters Certifying Official  
Director  
Office of Packaging and Transportation

Date: 05/20/2019