



Department of Energy
Washington, DC 20585

August 23, 2022

MEMORANDUM FOR JOHNNY O. MOORE
MANAGER

OAK RIDGE NATIONAL LABORATORY SITE OFFICE

FROM:

JULIA C. SHENK **Julia C. Shenk**
HEADQUARTERS CERTIFYING OFFICIAL
DIRECTOR
OFFICE OF PACKAGING AND TRANSPORTATION

Digitally signed by Julia C. Shenk
Date: 2022.08.23 11:04:13
04:00'

SUBJECT: Revision 2 of Department of Energy Certificate of Compliance Number 9228

In response to the application submitted by Chad Huffman to Dr. James Shuler of my staff on April 13, 2022, Department of Energy Certificate of the Compliance (CoC) Number 9228, Revision 2, for the Model 2000 Serial Number 2002 package is issued with its attached 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 August 31, 2025.

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

Attachment

cc: Chad Huffman, OSO
Herman Radke III, OSO
Greg Hirtz, ORNL
Matthew Howard, SRNL
James Shuler, EM-4.24
Docket 22-34-9228



**CERTIFICATE OF COMPLIANCE
For Radioactive Materials Package**

1a. Certificate Number	1b. Revision No.	1c. Package Identification No.	1d. Page No.	1e. Total No. Pages
9228	2	USA/9228/B(U)F-96 (DOE)	1	3

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

Oak Ridge National Laboratory
Site Office
P.O. Box 2008
Oak Ridge, TN 37831-6269

(2) Title and identification of report or application:

Safety Analysis Report for Packaging (SARP):

*GE-2000 HFIR Irradiated Fuel Element
Transport Package*, ORNL/RRD/INT-161, Rev.
0, May 2020, as supplemented in 5(e).

(3) Date:

May 2020

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: GE-2000, Serial Number 2003

(2) Description:

The GE-2000 is a lead-shielded cylindrical cask transported in the upright position inside an overpack structure.

The cask body is constructed of two concentric 1 inch thick 304 stainless steel cylindrical shells (ASTM A 240) with 4 inches (nominally) of lead poured between the shells. The shells joined at the bottom end to a 6 inch thick 304 stainless steel forging (ASTM A 182). The packaging overall dimensions are approximately 131.5 inches in height and 72.0 inches in diameter, and its gross weight is approximately 33,550 lbs. The cavity of the packaging is approximately 26.5 inches in diameter and 54.0 inches deep.

The cask lid is shielded with 4 inches (nominally) of lead and is fully recessed into the cask top flange and secured to the cask body by fifteen 1.25 inch diameter socket head screws.

6a. Date of Issuance: August 23, 2022	6b. Expiration Date: August 31, 2025
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) Julia C. Shenk Digitally signed by Julia C. Shenk Date: 2022.08.23 16:09:21 -04'00' Julia C. Shenk Director Headquarters Certifying Official Office of Packaging and Transportation#

Certificate Number	Revision No.	Package Identification No.	Page No.	Total No. Pages
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The containment system consists of the cask cavity shell, bottom forging with drain port plug; cask lid top forging with vent port plug; and cask lid seal inner O-rings. The cask lid seal is an aluminum retainer, placed between the cask body flange and lid, with four O-rings, two on each side of the retainer: the two inner rings are part of the containment system and the outer two rings are test seals.

The overpack is constructed from two 0.5 inch thick concentric 304 stainless steel cylindrical shells (ASTM A 240), 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 packaging. The top of the overpack is joined to the base by fifteen 1-3/8-inch diameter shoulder screws. Gussets on the top and bottom impact limiters provide tie-down points for the package. The lifting devices are detached during transport.

A fuel liner and basket is required for shipment of the contents.

(3) Drawings:

The packaging is constructed and assembled in accordance with the following drawings:

Table 1 - Packaging Design Drawings

Drawing No.	Rev.	Title
GE129D4946	501	<i>Model 2000 Transport Container Assembly FMF Certification Drawing</i>
M-11494-OH-134	3	<i>GE 2000 Cask Packaging Nameplate</i>
105E9520	9	<i>Model 2000 Shipping Cask All S/Ns Except 2001</i>
105E9521	7	<i>Model 2000 Cask Overpack All S/N's Except S/N 2001</i>
GE105E9523	501	<i>HFIR Fuel Liner and Basket FMF Certification Drawing</i>

(b) Contents:

(1) Type and form of material.

- (i) Irradiated High Flux Isotope Reactor (HFIR) fuel assembly, positioned within the HFIR fuel basket and liner (Drawing GE105E9523). The HFIR fuel assembly is fabricated in accordance with Oak Ridge National Laboratory Drawings: *HFIR Fuel Inner Element*, M-11524-OH-101, Rev. 1, and *HFIR Fuel Outer Element*, M-11524-OH-102, Rev. 1.

(2) Maximum quantity of material per package.

- (i) Contents not to exceed 5,450 lbs., including the required HFIR fuel liner and basket.
- (ii) One HFIR fuel assembly per package, limits as follows in Table 2:

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Table 2 – HFIR Fuel Assembly Limits

Item or assembly parameter	Maximum/(Minimum)
Inner fuel element (unirradiated)	2628 grams U-235
Outer fuel element (unirradiated)	6872 grams U-235
Uranium enrichment (unirradiated)	93.2 wt. % U-235
Fuel assembly burnup	2300 MWd
Decay (cooling) time to shipment	2 years (minimum)
Decay heat	600 watts

(c) Criticality Safety Index (CSI): 100.

(d) Conditions:

- (1) 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 of the SARP, as supplemented and the package must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the SARP, as supplemented.
- (2) The package shall be shipped in a vertical configuration.
- (3) Air transport is prohibited.
- (4) Only DOE or persons working under contract to DOE shall consign the package for shipment.
- (5) NRC or Agreement State licensees shall not consign a DOE certified package for shipment, but can transfer the material on-site to DOE or persons working under contract to DOE, for consignment of the package.
- (6) Revision 1 of this certificate may be used until August 31, 2023.

(e) Supplements:

- (1) *Safety Analysis Report for Packaging: GE-2000 HFIR Irradiated Fuel Element Transport Package*, ORNL/RRD/INT-161, Rev. 1, Page Changes, February, 2022.