

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

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|----------------------------------|--------------------------|-----------------------------|--|-----------|--------------|
| 1. a. CERTIFICATE NUMBER 5797 | b. REVISION NUMBER 22 | c. DOCKET NUMBER 71-5797 | d. PACKAGE IDENTIFICATION NUMBER USA/5797/B(U)F | PAGE 1 | PAGE OF 3 |
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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*)
U.S. Department of Energy
Washington, D.C. 20585
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Safety Analysis Report for Packaging the ORNL HFIR Unirradiated Fuel Element Shipping Container, ORNL/TM-11656, Rev. 11, dated July 2018, 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.: 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 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 dimension 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 by 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 Oak Ridge National Laboratory Drawing Nos. M-20978-EL-003E, Rev. F, and M-20978-EL-008E, Rev. C.

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5. (a) (3) Drawings (continued)
- (ii) The packaging for the outer HFIR fuel is constructed in accordance with Oak Ridge National Laboratory Drawing Nos. M-20978-EL-002E, Rev. E, and M-20978-EL-008E, Rev. C.
- (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 each fuel plate clad in aluminum, 10-mils thick. Only intact assemblies comprised of whole fuel plates with no known or suspected cladding defects are authorized, and:
- (i) For the packaging described in 5(a)(3)(i), the contents are described in the Oak Ridge National Laboratory Drawing No.: M11524-OH-106, Rev. 4.
- (ii) For the packaging described in 5(a)(3)(ii) the contents are described in the Oak Ridge National Laboratory Drawing No.: M11524-OH-107, Rev. 4.
- (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) Criticality Safety Index 0.4
6. The lid lifting attachments must be blocked as shown on Oak Ridge National Laboratory 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; and
- (b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 of the application.
8. Use of packagings fabricated after December 31, 1976, is not authorized.
9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

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10. Transport by air of fissile material is not authorized.
11. Revision 21 of this certificate may be used until October 31, 2021.
12. Expiration date: October 31, 2022.

REFERENCES

Safety Analysis Report for Packaging the ORNL HFIR Unirradiated Fuel Element Shipping Container, ORNL/TM-11656, Volumes 1 and 2, Revision 11, dated July 2018

Supplement: Safety Analysis Report for Packaging the ORNL HFIR Unirradiated Fuel Element Shipping Container, ORNL/TM-11656, Volumes 1 and 2, Revision 12 (page-changes), dated May 2020

Supplement: Safety Analysis Report for Packaging the ORNL HFIR Unirradiated Fuel Element Shipping Container, ORNL/TM-11656, Volumes 1 and 2, Revision 13 (page-changes), dated September 2020

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

John B. McKirgan

Digitally signed by John B. McKirgan

Date: 2020.10.08 12:39:02 -04'00'

John McKirgan, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: October 8, 2020





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Safety Evaluation Report
U.S. Department of Energy
Docket No. 71-5797
Model No. Inner HFIR Unirradiated Fuel Element Shipping Container,
and Outer HFIR Unirradiated Fuel Element Shipping Container

BACKGROUND

The High Flux Isotope Reactor (HFIR) Unirradiated Fuel Element Shipping Container is a Type B(U)F package, with contents described as U_3O_8 -Al cermet, enriched up to 95% in U^{235} , and clad in aluminum.

The Department of Energy (DOE) requested, by letter dated September 15, 2020, an amendment to the Certificate of Compliance (CoC) No. 5797, Rev. 21 (Docket 71-5797) to replace the Specification HFIR Fuel Elements, RRD-FE-3 in the CoC content definition, with two simplified fuel drawings, still showing all fuel attributes relevant to the technical analyses required to demonstrate regulatory compliance.

DOE requested these changes to improve both the fuel fabrication and inspection processes while minimizing any unnecessary changes to the CoC.

Based on the statements and representations in the application, the staff finds that these changes do not affect the ability of the Model No. Inner HFIR Unirradiated Fuel Element Shipping Container, and Outer HFIR Unirradiated Fuel Element Shipping Container package to meet the requirements of 10 CFR Part 71.

EVALUATION

Changes made to Chapter 1 of the SAR, Revision No. 13, include editorial corrections, the replacement of several detailed fuel fabrication drawings with two main drawings, and clarifications to the contents. The change of drawings is consistent with NUREG/CR 5502, "Engineering Drawings for 10 CFR Part 71 Package Approvals". The specification for High Flux Isotope Reactor Fuel Elements RRD-FE-3, ORNL/RRD/INT-37-V3, Revision 4, and the Oak Ridge National Laboratory Drawing Nos.: E-42118, Rev. R; E-42112, Rev. H; D-42113, Rev. G; D-42114, Rev. K; and E-42117, Rev. H, (for shipment in the inner HFIR packaging) and E-42126, Rev. N; E-42120, Rev. H; D-42121, Rev. H; D-42122, Rev K; and E-42125, Rev. J (for shipment in the outer HFIR packaging) were removed because they provide excessive details that are neither appropriate nor necessary as a condition of approval. This specification and the drawings were replaced with two simplified fuel drawings: HFIR Fuel Unirradiated Inner Element Certification Drawing—M-11524-OH-106 (Rev. 4) & HFIR Fuel Unirradiated Outer Element Certification Drawing—M-11524-OH-107 (Rev. 4). These drawings provide sufficient details to identify the package contents accurately and to provide an adequate basis for its safety evaluation. Notes were added to clarify (i) the role of burnable poisons and of the polyethylene wrapping in which the fuel elements are shipped, (ii) the listed weights of the inner

Enclosure

and outer fuel elements from 104 lb to 103.5 lb (inner) and from 202 lb to 205 lb (outer), (iii) the average fuel cladding thickness of at least 0.010 in. thick, and (iv) the fact that the boron content listed for the inner fuel element (2.8 g) is a nominal amount.

Chapter 2, Structural Evaluation, incorporates, in the structural model, key fuel element dimensions that are shown on the simplified drawings; the container designs have not changed and are not affected by the removal of the fuel fabrication drawings or the Fuel Specification. The applicant clarified that the inner and outer fuel element weights are 103.5 lbs. and 205 lbs., respectively, to be consistent with what is assumed in the analyses. Other editorial changes were made.

The features of the fuel which could affect the thermal evaluation, such as fuel dimensions and configuration (e.g., cladding and side plate thicknesses), materials of construction, and amount and type of nuclear material, have not been changed and are shown on the simplified drawings included in Chapter 1.

The containment boundary (i.e., the cladding and fuel matrix) has not changed. Editorial and clarification changes were made regarding the current fuel plate production processes or the frequency and sample size of a destructive testing.

The shielding and criticality evaluations are not affected by the removal of the Fuel Specification or detailed fuel fabrication drawings. In particular, the controlled container drawings are not altered nor changed and the key features of the fuel elements, including dimensions, form and composition of the fissile material, have not changed.

Chapter 7, Operating Procedures, is not impacted by the changes: an additional step is included in Section 7.1, Procedures for Loading Packages, to place the fuel element in a protective polyethylene wrapping to protect it from dust and moisture.

Chapter 8, Acceptance Tests and Maintenance Programs, is also unaffected since the packaging has not changed and maintenance tests do not address the maintenance of the HFIR fuel, as the fuel material is enclosed in an aluminum matrix and cladding.

Changes to Chapter 9, Quality Assurance, focus on the removal of the fuel fabrication drawings from Chapter 1 and the removal of the Fuel Specification from Chapter 4, Appendix C. Editorial changes have been also made.

Based on these findings listed above, the staff has reasonable assurance that that these changes do not affect the ability of the Model No. Inner HFIR Unirradiated Fuel Element Shipping Container, and Outer HFIR Unirradiated Fuel Element Shipping Container package to meet the requirements of 10 CFR Part 71.

CONDITIONS

The following changes were made to the CoC:

Condition No. 5(b)(1) was modified to add that only intact assemblies comprised of whole fuel plates with no known or suspected cladding defects are authorized, and that contents are now described in the Oak Ridge National Laboratory Drawing Nos.: M11524-OH-106, Rev. 4, and M11524-OH-107, Rev. 4, respectively.

Condition No. 7(c) on fuel elements meeting the fabrication requirements of the Specification for High Flux Isotope Reactor Fuel Elements, RRD-FE-3, was deleted.

Condition No. 11 was updated to extend the use of Revision No. 21 of the CoC by approximately one more year.

The References section of the certificate was updated to include the Safety Analysis Report for Packaging the ORNL HFIR Unirradiated Fuel Element Shipping Container, ORNL/TM-11656, Volumes 1 and 2, Revision 13 (page-changes), dated September 2020.

CONCLUSION

Based on the statements and representations in the application, the staff finds that these changes do not affect the ability of the Model No. Inner HFIR Unirradiated Fuel Element Shipping Container, and Outer HFIR Unirradiated Fuel Element Shipping Container package to meet the requirements of 10 CFR Part 71.

Issued with CoC No. 5797, Revision No. 22.