



U.S. Department  
of Transportation  
**Pipeline and  
Hazardous Materials  
Safety Administration**

**COMPETENT AUTHORITY CERTIFICATION  
FOR A TYPE B(U)F FISSILE  
RADIOACTIVE MATERIALS PACKAGE DESIGN  
CERTIFICATE USA/9367/B(U)F-96, REVISION 1**

East Building, PHH-23  
1200 New Jersey Avenue Southeast  
Washington, D.C. 20590

This certifies that the radioactive material package design described has been certified by the Competent Authority of the United States as meeting the regulatory requirements for a Type B(U)F packaging for fissile radioactive material as prescribed in the regulations of the International Atomic Energy Agency<sup>1</sup> and the United States of America<sup>2</sup>.

1. Package Identification - HI-STAR 180D.
2. Package Description and Authorized Radioactive Contents - as described in U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9367, Revision 1 (attached).
3. Criticality - The minimum criticality safety index is 0.0. The maximum number of packages per conveyance is determined in accordance with Table X of the IAEA regulations cited in this certificate.
4. General Conditions -
  - a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.
  - b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Hazardous Materials Technology, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.
  - c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

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<sup>1</sup> "Regulations for the Safe Transport of Radioactive Material, 1996 Edition (Revised), No. TS-R-1 (ST-1, Revised)," published by the International Atomic Energy Agency(IAEA), Vienna, Austria.

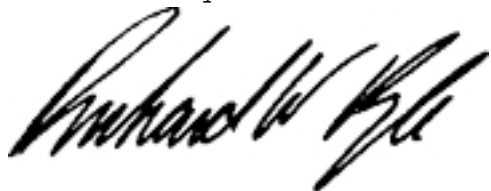
<sup>2</sup> Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

**CERTIFICATE USA/9367/B(U)F-96, REVISION 1**

- d. Records of Quality Assurance activities required by Paragraph 310 of the IAEA regulations<sup>1</sup> shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.
5. Special Condition - Transport by air of fissile material is not authorized.
6. Marking and Labeling - The package shall bear the marking USA/9367/B(U)F-96 in addition to other required markings and labeling.
7. Expiration Date - This certificate expires on July 31, 2019.

This certificate is issued in accordance with paragraph 814 of the IAEA Regulations and Section 173.471 and 173.472 of Title 49 of the Code of Federal Regulations, in response to the October 22, 2014 petition by Holtec International, Marlton, NJ, and in consideration of other information on file in this Office.

Certified By:



Dr. Magdy El-Sibaie  
Associate Administrator for Hazardous Materials Safety

**Nov 07 2014**  
(DATE)

Revision 1 - Issued to endorse U.S. Nuclear Regulatory Commission  
Certificate of Compliance No. 9367, Revision 1.

**CERTIFICATE OF COMPLIANCE  
FOR RADIOACTIVE MATERIAL PACKAGES**

1. a. CERTIFICATE NUMBER 9367	b. REVISION NUMBER 1	c. DOCKET NUMBER 71-9367	d. PACKAGE IDENTIFICATION NUMBER USA/9367/B(U)F-96	PAGE 1 OF	PAGES 4
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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

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|---|---|
| a. ISSUED TO ( <i>Name and Address</i> )<br>Holtec International<br>One Holtec Drive<br>Marlton, NJ 08053 | b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION<br>Holtec International Report No. HI-2125175, <i>Safety Analysis Report on the HI-STAR 180D Package</i> ,<br>Revision No. 3, dated July 16, 2014. |
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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.: HI-STAR 180D
- (2) Description

The HI-STAR 180D package is designed for transportation of undamaged irradiated Uranium Oxide (UO<sub>2</sub>) fuel assemblies. The fuel basket provides criticality control and the packaging body provides the containment boundary, helium retention boundary, moderator exclusion barrier, gamma and neutron radiation shielding, and heat rejection capability. The outer diameter of the HI-STAR 180D packaging is approximately 2712-mm without impact limiters and approximately 3250-mm with impact limiters. The maximum gross weight of the loaded HI-STAR 180D package is 125 Metric Tons.

Fuel Basket

Metamic-HT, a metal matrix composite of aluminum and boron carbide, is the principal constituent material of the fuel basket, both as structural material and neutron absorber material. Two interchangeable fuel basket models, designated F-32 and F-37, contain either 32 or 37 Pressurized Water Reactor (PWR) fuel assemblies respectively, in regionalized and uniform loading patterns. The fuel basket features flux traps between some, but not all, cells.

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5.(a)(2) Description (Continued)

Packaging Body

The cylindrical steel shell containment system is welded to a bottom steel baseplate and a top steel forging machined to receive two independent steel closure lids, with each lid being individually designated as a containment boundary component. The outer surface of the cask inner shell is buttressed with a monolithic shield cylinder for gamma and neutron shielding. Each closure lid features a dual metallic self-energizing seal system designed to ensure its containment and moderator exclusion functions. For this package, the inner closure lid inner seal and the inner closure lid vent/drain port cover inner seals are the containment boundary components on the inner lid; the outer closure lid inner seal and the outer closure lid access port plug seal are the containment boundary components on the outer lid.

Impact Limiters

The HI-STAR 180D package is fitted with two impact limiters fabricated of aluminum crush material completely enclosed by an all-welded austenitic stainless steel skin. Both impact limiters are attached to the body of the packaging with 16 bolts.

(3) Drawings

The packaging shall be constructed and assembled in accordance with the following Holtec International Drawing Numbers:

- (a) HI-STAR 180D Cask                      Drawing No. 8545, sheets 1-12, Rev. 4
- (b) F-37 and F-32 Fuel Baskets        Drawing No. 8553, sheets 1-6, Rev. 4
- (c) HI-STAR 180D Impact Limiter      Drawing No. 8552, sheets 1-5, Rev. 3

5.(b) Contents

(1) Type, Form, and Quantity of Material

- (a) Only undamaged UO<sub>2</sub> fuel assemblies, with a Zr cladding type, meeting the specifications and requirements provided in Conditions 5.b(1)(b) through 5.b(1)(i), and with the characteristics listed in Table 7.D.1 of the application, are authorized for transportation.

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5.(b)(1)(a) Continued

- (b) Damaged fuel assemblies, i.e., assemblies with known or suspected cladding defects greater than pinhole leaks or hairline cracks and which cannot be handled by normal means, as well as fuel debris, non-fuel hardware and neutron sources are not authorized contents.
- (c) The maximum initial enrichment of any UO<sub>2</sub> assembly is 4.55 wt.% <sup>235</sup>U.
- (d) The post-irradiation minimum cooling time, maximum burnup, maximum decay heat load, and minimum initial enrichment per assembly are listed in Tables 7.D.2 and 7.D.3 of the application. The cell numbering for the F-32 and F-37 fuel baskets is depicted in Figures 7.D.1 and 7.D.2 of the application, respectively.
- (e) Regions and cells for regionalized loading of the F-32 and F-37 baskets are identified in Table 7.D.5 of the application. Table 7.D.6 of the application provides the minimum burnup requirements for the F-37 basket, based on initial enrichment. Fuel assemblies with a maximum of 50 cm of control rod insertion during irradiation may be transported in the F-37 basket.
- (f) In-core operating limits for those assemblies that need to meet the burnup requirements in Table 7.D.6 of the application are listed in Table 7.D.7 of the application. In addition, the maximum average fuel temperature during irradiation is 1251°K (977.9°C).
- (g) For those spent fuel assemblies that need to meet the burnup requirements specified in Table 7.D.6 of the application, a burnup verification shall be performed in accordance with Appendix 7.E of the application.
- (h) Allowable loading patterns and fuel specifications for each basket region are referenced in Tables 7.D.2 and 7.D.3 of the application. Alternative fuel specifications for each regional loading pattern are presented in Table 7.D.4 of the application.
- (i) The maximum decay heat is 33.08 kW for the F-32 basket and 36.4 kW for the F-37 basket.

5.b.(2) Maximum Quantity of Material Per Package

32 or 37 PWR fuel assemblies, as described in 5(b)(1), in the F-32 or F-37 basket, respectively.

5.(c) Criticality Safety Index (CSI)= 0.0

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

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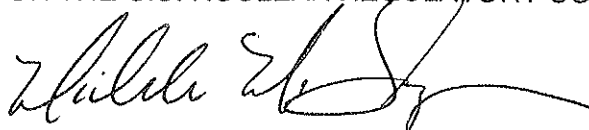
1. a. CERTIFICATE NUMBER 9367	b. REVISION NUMBER 1	c. DOCKET NUMBER 71-9367	d. PACKAGE IDENTIFICATION NUMBER USA/9367/B(U)F-96	PAGE 4	OF 4	PAGES 4
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- (a) The package shall be prepared for shipment and operated in accordance with Chapter 7 of the application.
- (b) The package shall meet the acceptance tests and be maintained in accordance with Chapter 8 of the application. For the bend test qualification of a representative friction stir weld sample, the sample must meet the visual acceptance criteria of ASME Section III, Subsection NG 5362.
7. The personnel barrier shall be installed and remain installed while transporting the package if necessary to meet package surface temperature and/or package dose rates requirements.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.
9. Transport by air of fissile material is not authorized.
10. Expiration Date: July 31, 2019

REFERENCES:

Holtec International application "Safety Analysis Report on the HI-STAR 180D Package," Revision No. 3, dated July 16, 2014.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Michele M. Sampson, Chief  
Licensing Branch  
Division of Spent Fuel Storage and Transportation  
Office of Nuclear Material Safety  
and Safeguards

Date: September 10, 2014



U.S. Department  
of Transportation

East Building, PHH-23  
1200 New Jersey Avenue SE  
Washington, D.C. 20590

**Pipeline and  
Hazardous Materials  
Safety Administration**

**CERTIFICATE NUMBER:** USA/9367/B(U)F-96, Revision 1

**ORIGINAL REGISTRANT(S):**

Mr. Luis Hinojosa  
Corporate Adjunct Licensing Manager  
Holtec International  
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One Holtec Drive  
Marlton, NJ 08053