U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

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

COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U) RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/9355/B(U)-96, REVISION 3

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type B(U) package as prescribed in the regulations of the International Atomic Energy Agency[1] and the United States of America[2] The package design is approved for use within the United States for import and export shipments made in accordance with applicable international and domestic transport regulations.

1. Package Identification - Model No. 435-B.

2. Package Description and Authorized Radioactive Contents - as described in U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9355, Revision 3 (attached).

3. 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 Engineering and Research, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

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[1] "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

[2] Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

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.

d. Records of Management System activities required by Paragraph 306 of the IAEA regulations[1] 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.

4. Special Conditions -

a. Plutonium sources are not permitted for transport by air.

b. Americium sources are not permitted for transport by air.

5. Marking and Labeling - The package shall bear the marking USA/9355/B(U)-96 in addition to other required markings and labeling.

6. Expiration Date - This certificate expires on March 31, 2025. Previous editions which have not reached their expiration date may continue to be used.

This certificate is issued in accordance with paragraph(s) 810 of the IAEA Regulations and Section 173.471 of Title 49 of the Code of Federal Regulations, in response to the June 10, 2020 petition by National Nuclear Security Administration, Department of Energy, Albuquerque, NM, and in consideration of other information on file in this Office.

Certified By:

for William Schoonover
Associate Administrator for Hazardous Materials Safety

June 18, 2020
(DATE)

Revision 3 - Issued to endorse U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9355, Revision 3.

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9355	3	71-9355	USA/9355/B(U)-96	1 OF	8

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)*

National Nuclear Security Administration
P.O. Box 5400
Albuquerque, NM 87185

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

National Nuclear Security Administration application dated September 19, 2019.

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.: 435-B

(2) Description

The Model No. 435-B package consists of multiple configurations. The package is a Category I container. When loaded and prepared for transport, the external dimensions of the 435-B package are approximately 83 inches (in.) [210.8 centimeters (cm)] tall and 70 in. [177.8 cm] in diameter (over the lower impact limiter). The maximum weight of the package is 10,100 pounds (lb.) [4,545.5 kilograms (kg)].

Unless noted in the application, all elements of the 435-B package are made of Type 304 stainless steel in conformance with the American Standards for Testing Materials (ASTM) A240. The major components of the package include:

(i) *A base*—The base consists of the lower torispherical head, lower flange, lower internal impact limiter, and external impact limiter. The volume inside the external impact limiter is filled with 15 pounds per cubic feet (lb/ft^3) polyurethane foam poured in place. The inside surface of the bottom shell is covered with a ¼-inch thick layer of refractory insulation paper. A full penetration weld connects the lower torispherical head (½-inch thick plate) to the lower flange.

(ii) *A bell*—The bell consists of the upper torispherical head, cylindrical shell, upper flange, vent and test port blocks, upper internal impact limiter, dual side thermal shield, head thermal shield, and the closure bolt access tube structure. Two, ¼-inch thick, layers of refractory insulation paper cover the area of the containment wall adjacent to the tubes. Machined blocks of 30 lb/ft^3 polyurethane foam are located between the tubes.

5.(a) Packaging (Continued)

(2) Description

(iii) *Internal lodgments*, made of aluminum, which support the Long Term Storage Shield (LTSS), Disposal Canisters, or the IBL 437 (aka IBL 437C) Shielded Device (Type 1 or Type 2)—The lodgments and the inner container designs allow maintaining the position of the payload in the package cavity during normal conditions of transport and hypothetical accident conditions. The LTSS rests on a ½-inch thick plate covered with a ½-inch thick layer of neoprene rubber.

(iv) *LTSS*—The LTSS consists of a central steel magazine, or barrel, surrounded by thick lead encased in a steel shell. The barrel contains four longitudinal holes, each of which can accommodate one drawer assembly.

(v) *An inner container*, which supports shielded devices (including Hopewell Designs, Inc. Shielded Devices and Transport Shield) —The inner container holds a shielded device and provides support for the device and the blocking (dunnage) materials during transport.

(vi) *Two internal impact limiters*—The internal impact limiters located at each end of the payload cavity include an array of 130 ASTM A249 or A269, Type TP304, stainless steel tubes. The impact limiters are curved on one side to match the inside of the torispherical head, and flat on the other. Each of the 130 tubes is tack-welded in three places to a stainless steel tube stabilizer sheet. Four stainless steel clips welded to the inner surface of the containment boundary in the lower and upper position hold the internal impact limiters in place.

The LTSS, Disposal Canisters, or shielded devices provide shielding. Shielding materials are lead, tungsten, steel, or depleted uranium. The LTSS provides the shielding for the sealed capsule content specified in Tables 1 and 2. Therefore, these sources must be packed in the LTSS drawer(s). The shielded devices, identified in Table 3, are self-shielding, and must be packed in an inner container for shipment as specified in Table 4.

(3) Drawings

The packaging is constructed in accordance with AREVA Federal Services LLC drawings:

1) 1916-01-01-SAR, “435-B Package Assembly SAR Drawing,” sheets 1-7, Revision 7
2) 1916-01-02-SAR, “435-B LTSS Lodgment SAR Drawing,” sheets 1-2, Revision 4
3) 1916-01-03-SAR, “435-B Inner Container SAR Drawing,” sheets 1-2, Revision 4
4) 1916–01–04–SAR, “435-B Disposal Canister Lodgment SAR Drawing,” sheets 1-2, Revision 0; and
5) 1916–01–05–SAR, “435-B IBL 437 Lodgment SAR Drawing,” sheets 1-2, Revision 1.

5.(b) Contents

(1) Type and form of material

Radioactive sealed sources of isotopes described in Tables 1 through 5.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package

(i) LTSS

Table 1. Maximum Activity of LTSS Payload Source Nuclides [1, 2, 3, 4]

Nuclide	Maximum Activity Ci
^{60}Co	12,970
^{137}Cs	14,000
^{90}Sr	1,000
^{226}Ra (no Be) [5]	20
^{226}Ra Be [5]	1.2
^{241}Am (no Be) [6]	1,000
^{241}Am Be [6]	6.6
^{192}Ir	200
^{75}Se	80

Notes:
1. Physical form of all nuclides is solid material in a sealed capsule.
2. The maximum decay heat limit for the 435-B package is 200W.
3. The values in the table represent the absolute maximum activities allowed in the 435-B. Individual payload activity limits depend on the configuration of the LTSS used. Payload activity limits are specified in Section 7.1.4, “Loading and Preparing the LTSS for Transport,” of the application.
4. The sum of the LTSS payload activities listed above is 86,732 A_2, which bounds the value for the Disposal Canister. This value exceeds the maximum number of A_2 that could be transported.
5. Impurities may include oxygen, carbon, sulfur, bromine, and chlorine (hydrous and anhydrous).
6. Impurities may include oxygen and chlorine.

Table 2. Maximum Mass of LTSS Payload Source Nuclides. [1, 2]

Nuclide	Maximum Mass grams of Pu
^{238}Pu (no Be)	75 g Pu
^{239}Pu (no Be)	15 g Pu
^{239}Pu Be	15 g Pu

Notes:
1. Physical form of all nuclides is solid material in a sealed capsule.
2. Impurities may include oxygen.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package (Continued)

(ii) Inner Container-Shielded Devices

Table 3. Maximum Activity and Weight of Shielded Devices [1]

Model Name/Type	Maximum Activity Ci	Nominal Weight [2] lb.	Sealed Source Device Registry No.[3]
Group 1 Devices			
Gammator 50B, B, B34, G-50-B	420	1,800	NR-0880-D-802-S
Gammator M34	1,920	1,850	NR-0880-D-806-S
Gammator M38	3,840	2,250	NR-0880-D-806-S
Gammacell 1000 (GC-1000) -Models A through D -Elite A through D, Type I and Type II	3,840 (bounding value)	2,800	NR-0880-D-808-S, NR-1307-D-102-S
Gammacell 3000 (GC-3000) -Elan A through C, Type I and Type II [2]	3,048	3,300	NR-1307-D-102-S
Group 3 Devices			
Gammacell-40 (GC-40 Exactor)	2,250 [4]	2,650	NR-1307-D-101-S
Other Devices			
IBL 437 (aka IBL 437C)	5,160	4,550	MA-0219-D-813-S

Notes:
1. Radionuclide in all cases is ^{137}Cs.
2. Gammacell 3000 external secondary shielding is not credited in the shielding analysis.
3. Consult NRC's Sealed Source Device Registry for design and safety features of each model.
4. GC-40 activity is given for one of the two device components that make up a complete GC-40. Only one device component may be shipped at one time.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package (Continued)

(ii) Inner Container-Shielded Devices (Continued)

Table 4. Hopewell Designs, Inc. Shielded Devices and Transport Shield

	Model Name	Maximum Activity			Maximum Weight lb.
		Option a	Option b	Option c	
Shielded Devices	***G10-1-360***	530 Ci ^{137}Cs or 2 Ci ^{60}Co	---	---	≤ 1,200
	G10-2-360	530 Ci ^{137}Cs and 2 Ci ^{60}Co	Total 530 Ci ^{137}Cs in 2 sources	Total 2 Ci ^{60}Co in 2 sources	≤ 1,900
	G10-1-2600	2,800 Ci ^{137}Cs or 5 Ci ^{60}Co	---	---	≤ 1,600
	G10-2-2600	2,800 Ci ^{137}Cs and 5 Ci ^{60}Co	Total 2,800 Ci ^{137}Cs in 2 sources	Total 5 Ci ^{60}Co in 2 sources	≤ 2,200
	G10-2-2600-BX	2,800 Ci ^{137}Cs and 5 Ci ^{60}Co	Total 2,800 Ci ^{137}Cs in 2 sources	Total 5 Ci ^{60}Co in 2 sources	≤ 2,200
Transport Shield	***SC2323-GC60***	5,952 Ci ^{137}Cs and 1,945 Ci ^{60}Co and ***shall not exceed 30W decay heat***	---	---	≤ 3,500

5.(b) Contents (Continued)

(2) Maximum quantity of material per package (Continued)

(iii) Disposal Canisters

Table 5. Disposal Canisters Source Nuclides.[1, 2, 3, 4]

Nuclide	Maximum Activity Ci
^{60}Co	12,970
^{137}Cs	27,000
^{90}Sr	1,000
^{226}Ra (no Be) [5]	20
^{226}Ra Be [5]	4.88
^{192}Ir	200
^{75}Se	80

Notes:
1. Physical form of all nuclides is solid material in a sealed capsule.
2. The maximum decay heat limit for the 435-B package is 200 W.
3. The values in the table represent the absolute maximum activities allowed in the 435-B. Individual payload activity limits depend on the specific Disposal Canister used. Payload activity limits are specified in Section 7.1.5, "Loading and Preparing the Disposal Canisters for Transport" of the application.
4. The sum of the LTSS payload activities listed above is 86,732 A_2, which bounds the value for the Disposal Canister. This value exceeds the maximum number of A_2 that could be transported.
5. Impurities may include oxygen, carbon, sulfur, bromine, and chlorine (hydrous and anhydrous).

(3) The maximum weight of contents in the package is 5,160 lb. Conditions 5.(b)(3)(i) through (v) include the maximum weight of the authorized contents.

(i) LTSS

For the LTSS, the payload of isotopes other than plutonium is limited by the activity rather than their weight as depicted in Tables 1 and 2 of this certificate. The maximum weight of the LTSS and its contents is 4,660 lb.

5.(b)(3) Contents (Continued)

(ii) Inner Container

The maximum weight of the shielded device includes the mass of radioactive material and the source drawer.

Table 6. Maximum Weight of Inner Container Contents

Content Type	Maximum Weight lb.
Dunnage	≤ 500
Group 1-Shielded Device	≤ 3,500
Group 3-Shielded Device	≤ 3,500
IBL 437 (aka IBL 437C)	≤ 4,550

(iii) Disposal Canisters

Table 7. Maximum Weight of Disposal Canisters Payload

Content Type	Maximum Weight of Payload lb.
Lodgment	≤ 500
Heavy Disposal Canister	≤ 4,610
Medium Disposal Canister	≤ 4,630
Light Disposal Canister	≤ 4,165

(iv) Honeywell Inc. Shielded Devices: Type 1 and Type 2

The maximum weight of Type 1 or Type 2 Honeywell devices is 3,500 lb.

(v) The total fissile mass limit for the 435-B package is 15 grams.

(4) Maximum decay heat

Table 8. Maximum Decay Heat of the Package's Authorized Contents

Content Type	Decay Heat W
LTSS shielded devices	≤ 200
Inner container shielded devices	≤ 30
IBL 437 (aka IBL 437C) Shielded Device	≤ 15
Hopewell Designs, Inc. Transport Shield	≤ 30
Heavy disposal canister	≤ 200
Medium disposal canister	≤ 159
Light disposal canister	≤ 144

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6. Plutonium sources are not permitted for transport by air.

7. Americium sources are not permitted for transport by air.

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

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7.0 of the application; and

   (b) The package must meet the Acceptance Tests and Maintenance Program of Chapter 8.0 of the application.

9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

10. Expiration date: March 31, 2025.

REFERENCES

National Nuclear Security Administration application dated September 19, 2019.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/

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

Date: 3/12/20

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

U.S. Department of
Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

CERTIFICATE NUMBER: USA/9355/B(U)-96

ORIGINAL REGISTRANT(S):

International Isotopes Inc.
4137 Commerce Circle
Idaho Falls, ID, 83401
USA

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