

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9355	34	71-9355	USA/9355/B(U)-96	1 OF	8

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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 (<i>Name and Address</i>)
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. |
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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.: 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.) [4,545.581 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/ft³) 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/ft³ polyurethane foam are located between the tubes.

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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 and Table 4, are self-shielding, and must be packed in an inner container for shipment as specified in Table 4, except other devices such as the IBL 437. The LTSS, Disposal Canisters, and IBL 437 are supported by lodgments for shipment.~~

~~The With the exception of the Disposal Canister contents, the package must be transported singly. For Disposal Canister contents, the package must be transported in a closed container as exclusive use, in quantities of one or two. package is to be transported singly, with the exception of the Disposal Canisters as contents. The package is transported exclusive use in a closed vehicle in quantities of one or two when loaded with the Disposal Canisters.~~

(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

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

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5.(b) Contents (Continued)

(2) Maximum quantity of material per package

(i) Sealed Sources for transport in the LTSS-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:

- Physical form of all nuclides is solid material in a sealed capsule.
- The maximum decay heat limit for the 435-B package is 200W.
- 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.
- ~~The LTSS shall be transported using the lodgment depicted on drawing 1916-01-02-SAR. The sum of the LTSS payload activities listed above is 86,732 A₂, which bounds the value for the Disposal Canister. This value exceeds the maximum number of A₂ that could be transported.~~
- Impurities may include oxygen, carbon, sulfur, bromine, and chlorine (hydrous and anhydrous).
- 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:

- Physical form of all nuclides is solid material in a sealed capsule.
- Impurities may include oxygen.

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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 ⁵			
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 ⁵			
Gammacell-40 (GC-40 Exactor)	2,250 ⁴	2,650	NR-1307-D-101-S
Other Devices			
IBL 437 (aka IBL 437C) ⁵	5,160	4,550 ⁶	MA-0219-D-813-S

Notes:

1. Radionuclide in all cases is ¹³⁷Cs.
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. Group 1 Devices and Group 3 Devices shall be transported using the Inner Container depicted on drawing 1916-01-03-SAR. The IBL 437 (aka IBL 437C) shall be transported using the lodgment depicted on drawing 1916-01-05-SAR.
6. Maximum weight.

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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 ¹

	Model Name	Maximum Activity		
		Option a	Option b	Option c
Shielded Devices	G10-1-360	530 Ci ¹³⁷ Cs or 2 Ci ⁶⁰ Co	---	---
	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
	G10-1-2600	2,800 Ci ¹³⁷ Cs or 5 Ci ⁶⁰ Co	---	---
	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
	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
Transport Shield	SC2323-GC60	5,952 Ci ¹³⁷ Cs and 1,945 Ci ⁶⁰ Co and shall not exceed 30W decay heat	---	---

Notes:

1. All Shielded Devices and the Transport Shield shall be transported using the Inner Container depicted on drawing 1916-01-03-SAR.

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5.(b) Contents (Continued)

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

(iii) Sealed Sources for transport in the Disposal Canisters ~~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:

- Physical form of all nuclides is solid material in a sealed capsule.
- The maximum decay heat limit for the 435-B package is 200 W.
- 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.
- The Disposal Canisters shall be transported using the lodgment depicted on drawing 1916-01-04-SAR. The sum of the LTSS payload activities listed above is 86,732 A₂, which bounds the value for the Disposal Canister. This value exceeds the maximum number of A₂ that could be transported.
- 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.

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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
Hopewell Designs, Inc., shielded devices and transport shield IBL 437 (aka IBL 437C)	≤ 43,550 00

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(iii) Disposal Canisters

Table 7. Maximum Weight of Disposal Canisters Payload

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

(iv) The maximum weight of the IBL 437 (aka IBL 437C), Type 1 and Type 2, is 4,550 lb. Honeywell Inc. Shielded Devices: Type 1 and Type 2

(iv) 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	Described in Condition No.	Decay Heat, W
LTSS	Section 5.(b)(2)(i)	≤ 200
Group 1 Shielded Devices	Section 5.(b)(2)(ii)	≤ 30
Group 3 Shielded Devices		
Hopewell Designs, Inc., Transport Shield		
Hopewell Designs, Inc. G10 Series Shielded Devices	Section 5.(b)(2)(ii)	≤ 3015

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IBL 437 (aka IBL 437C) Shielded Device	Section 5.(b)(2)(ii)	≤ 15
Heavy disposal canister	Section 5.(b)(2)(iii)	≤ 200
Medium disposal canister	Section 5.(b)(2)(iii)	≤ 159
Light disposal canister	Section 5.(b)(2)(iii)	≤ 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: 3/10/2021