原規規発第2001097号
令和2年1月9日

原燃輸送株式会社
代表取締役社長　高杉　政博　殿

原子力規制委員会

核燃料輸送物設計承認英文証明書について

工場又は事業所の外において運搬される核燃料輸送物の確認等に関する事務手続について（平成23年6月1日付け平成23・03・07原院第7号）4.（3）に基づき、令和元年12月18日付け原設発第56号をもって申請のあった標記の件について、添付のとおり証明します。

IDENTIFICATION MARK
J/130/B(M)F-96 (Rev. 4)

COMPETENT AUTHORITY
OF
JAPAN

CERTIFICATE FOR APPROVAL OF PACKAGE DESIGN FOR THE TRANSPORT OF RADIOACTIVE MATERIALS

ISSUED BY

NUCLEAR REGULATION AUTHORITY
1-9-9, ROPPONGI MINATO-KU
TOKYO, JAPAN

CERTIFICATE FOR APPROVAL OF PACKAGE DESIGN FOR THE TRANSPORT OF RADIOACTIVE MATERIALS

This is to certify, in response to the application by NUCLEAR FUEL TRANSPORT Co., LTD., that the package design described herein complies with the design requirements for a package containing high level vitrified residue waste, specified in the 2012 Edition of the Regulations for the Safe Transport of Radioactive Material (International Atomic Energy Agency, Safety Standards Series No.SSR-6) and the Japanese rules based on the Act on Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors.

This certificate does not relieve the consignor from compliance with any requirement of the government of any country through or into which the package will be transported.

COMPETENT AUTHORITY
IDENTIFICATION MARK: J/130/B(M)F-96 (Rev. 4)

Jan. 9. 2020
Date

Hasegawa Kiyomitsu

Director, Division of Licensing for
Nuclear Fuel Facilities

Secretariat of Nuclear Regulation Authority
Competent Authority of JAPAN
for Package Design Approval

1. The Competent Authority Identification Mark : J/130/B(M)F-96(Rev.4)

2. Name of Package : Type TN28VT

3. Type of Package : Type B(M) Package containing Fissile Material

4. Specification of Package
(1) Main Materials of Packaging : See the attached Table 1
(2) Total Weight of Packaging : Approximately 98 tons (when using basket for 28 canisters)
Approximately 102 tons (when using basket for 20 canisters)
(3) Outer Dimensions of Packaging
(i) Length : Approximately 6.6 m (Including Shock Absorbing Cover)
(ii) Outer Diameter : Approximately 2.4 m
(4) Total Weight of Package : 113.5 tons or less
(5) Illustration of Package : See the attached Figure 1 and Figure 2

5. Specification of Radioactive Contents: See the attached Table 2, Table 3, Table 4 and Table 5.

6. Description of Containment System
Containment system consists of a body, a lid, and an orifice plug.
Vitrified waste is enclosed with metal canisters.

7. For Package containing Fissile Materials
(1) Restrictions on Package
(i) Restriction Number "N" : No restriction
(ii) Array of Package : No restriction
(iii) Criticality Safety Index (CSI) : 0
(2) Description of Confinement System
No equipment corresponds to confinement system for criticality.
(3) Assumptions of Leakage of Water into Package
This critical calculation takes the event of water leaking into packaging into account.
(4) Special Features in Criticality Assessment
Since fissile materials are diluted by glass matrix or disk, criticality is not concerned.

8. For Type B (M) Packages, a statement regarding prescriptions of Type B(U) Package that do not apply to this Package
Ambient temperature up to −40℃ is not considered

9. Assumed Ambient Conditions
(i) Ambient Temperature Range : −20 to 38℃
(ii) Insolation Data : Table 12 of IAEA Regulation

10. Handling, Inspection and Maintenance

(1) Handling Instructions

Handling of the transport packaging should be done using handling equipment such as specially designed lifting beams, cranes, etc. Safety measures should be made for each operation by checking that there are no defects in the transport packaging, lifting beams, and equipment.

(2) Inspections and Maintenance of Packaging

Periodic inspection of the transport packaging shall be subjected to inspections of external appearance and lifting once or more a year (But once or more per 10 times of use in the case that it is used more than 10 times a year.) and shall be subject to inspections of leak tightness before loading and immediately after unloading (Interval between two leak tightness inspections shall not be longer than 24 months.).

(3) Actions prior to Shipment

The following inspections shall be performed prior to shipment.

(ⅰ) Visual Inspection (ⅱ) Lifting Inspection (ⅲ) Weight Inspection
(ⅳ) Surface Contamination Inspection (ⅴ) Dose Equivalent Rate Inspection
(ⅵ) Contents Inspection (ⅶ) Temperature Measurement Inspection
(ⅷ) Leak Tightness Inspection (ⅸ) Pressure Measurement Inspection

(4) Precautions for Loading of Package for Shipment

Package shall be securely loaded to the conveyance at the designated tie-down portion of the packaging so as not to move, roll down or fall down from the loading position during transport.

11. Issue Date and Expiry Date

(ⅰ) Issue Date : July14, 2019
(ⅱ) Expiry Date : July13, 2024

Table 1 Main materials of packaging

Parts	Main Material
Packaging body	Carbon steel, Resin, Copper, Wood
Lid	Stainless steel, Resin
Basket	Aluminum alloy, Stainless steel
Shock absorbing cover	Stainless steel, Wood, Resin

Table 2

Nuclide, specification, weight and radioactivity of nuclear fuel material to be contained (UK vitrified residue canister) (Per vitrified residue canister)

	When using basket for 28 canisters	When using basket for 20 canisters
Type of Content	High Level Radioactive Waste	
Condition	Solid (Vitrified Residue)	
Weight	Up to 2,000g (U Isotope), Up to 200g (Pu isotope)	
Radioactive Strength	Nuclides that emit α-ray : Up to 3.5×10^{2} TBq Nuclides that do not emit α-ray : Up to 4.5×10^{4} TBq	

Radioactivity : The activity of main nuclides shall satisfy the following calculation formula.

$$\sum_{j=1}^{14}\frac{Rj}{Aj}\leq 0.8$$

Where, Rj represents the activity classified by main nuclides per vitrified residue canister to be loaded. Aj represents the maximum activity classified by main nuclides in the case of only one kind of nuclide being contained inside the vitrified residue canister.

The main nuclides and Aj are as follows.

	j	Main Nuclides	Aj value	
			When using basket for 28 canisters	When using basket for 20 canisters
α nuclide (Bq)	1	^{238}Pu	5.0×10^{14}	9.0×10^{14}
	2	^{239}Pu	6.0×10^{14}	1.0×10^{15}
	3	^{240}Pu	6.0×10^{14}	1.0×10^{15}
	4	^{241}Am	5.0×10^{14}	9.0×10^{14}
	5	^{242}Cm	3.0×10^{14}	6.0×10^{14}
	6	^{243}Cm	4.0×10^{14}	7.0×10^{14}
	7	^{244}Cm	2.0×10^{14}	3.4×10^{14}
$\beta\gamma$ nuclide (Bq)	8	^{60}Co	2.0×10^{14}	9.0×10^{14}
	9	^{90}Sr+(^{90}Y)	1.3×10^{17}	5.0×10^{17}
	10	^{106}Ru+(^{106}Rh)	2.9×10^{15}	9.0×10^{15}
	11	^{134}Cs	3.7×10^{15}	2.0×10^{16}
	12	^{137}Cs+(^{137m}Ba)	1.4×10^{17}	1.2×10^{18}
	13	^{144}Ce+(^{144}Pr)	1.5×10^{15}	4.5×10^{15}
	14	^{154}Eu	6.3×10^{14}	2.5×10^{15}

Notes: When mother and daughter nuclides are in state of radiation equilibrium (j= 9, 10, 12, 13), maximum activity of mother nuclides is shown.

Number of Vitrified Residue Canisters*1	Up to 28 canisters	Up to 20 canisters
Heat Power	Up to 1.46kW Up to 1.70kW*2	Up to 2.00kW

*1 When total number of canisters is less than specified number, the vacant spaces shall be filled with dummy canisters.

*2 Loading 4 dummy canisters in center lodgment of basket for 28 canisters.

Table 3

Nuclide, specification, weight and radioactivity of nuclear fuel material to be contained

(French vitrified residue canister) (Per vitrified residue canister)

	When using basket for 28 canisters	When using basket for 20 canisters
Type of Content	High Level Radioactive Waste	
Condition	Solid (Vitrified Residue)	
Weight	Up to 4,500g (U isotope), Up to 110g (Pu isotope)	

Radioactivity : The activity of main nuclides shall satisfy the following calculation formula.

$$\sum_{j=1}^{9} \frac{Rj}{Aj} \leq 0.8$$

Where, Rj represents the activity classified by main nuclides per vitrified residue canister to be loaded. Aj represents the maximum activity classified by main nuclides in the case of only one kind of nuclide being contained inside the vitrified residue canister.

The main nuclides and Aj are as follows.

	j	Main Nuclides	Aj value	
			When using basket for 28 canisters	When using basket for 20 canisters
α nuclide (Bq)	1	^{241}Am	5.0×10^{14}	9.0×10^{14}
	2	^{244}Cm	2.0×10^{14}	3.4×10^{14}
$\beta\ \gamma$ nuclide (Bq)	3	^{60}Co	2.0×10^{14}	9.0×10^{14}
	4	$^{90}Sr+(^{90}Y)$	1.3×10^{17}	5.0×10^{17}
	5	$^{106}Ru+(^{106}Rh)$	2.9×10^{15}	9.0×10^{15}
	6	^{134}Cs	3.7×10^{15}	2.0×10^{16}
	7	$^{137}Cs+(^{137m}Ba)$	1.4×10^{17}	1.2×10^{18}
	8	$^{144}Ce+(^{144}Pr)$	1.5×10^{15}	4.5×10^{15}
	9	^{154}Eu	6.3×10^{14}	2.5×10^{15}

Notes: When mother and daughter nuclides are in state of radiation equilibrium (j= 4, 5, 7, 8), maximum activity of mother nuclides is shown. In addition, if the quantity of the radioactivity of α nuclide per loaded vitrified residue canister is represented by weight, the specific activity of 1.268×10^{11}Bq/g (^{241}Am) and 2.993×10^{12}Bq/g (^{244}Cm) is used.

Number of Vitrified Residue Canisters*1	Up to 28 canisters	Up to 20 canisters
Heat Power	Up to 1.46kW Up to 1.70kW*2	Up to 2.00kW

*1 When total number of canisters is less than specified number, the vacant spaces shall be filled with dummy canisters.

*2 Loading 4 dummy canisters in center lodgment of basket for 28 canister.

Table 4

Nuclide, specification, weight and radioactivity of nuclear fuel material to be contained
(Low level radioactive waste vitrified residue canister :CSD-B*1) (Per CSD-B canister)

	When using basket for 28 canisters	When using basket for 20 canisters
Type of Content	CSD-B	
Condition	Solid (Vitrified Residue)	
Weight	Up to 4,500g (U isotope), Up to 110g (Pu isotope)	

Radioactivity : The activity of main nuclides shall satisfy the following calculation formula.

$$\sum_{j=1}^{9} \frac{Rj}{Aj} \leq 0.4$$

Where, Rj represents the activity classified by main nuclides per vitrified residue canister to be loaded. Aj represents the maximum activity classified by main nuclides in the case of only one kind of nuclide being contained inside the vitrified residue canister.

The main nuclides and Aj are as follows.

	j	Main Nuclides	Aj value	
			When using basket for 28 canisters	When using basket for 20 canisters
α nuclide (Bq)	1	^{241}Am	5.0×10^{14}	9.0×10^{14}
	2	^{244}Cm	2.0×10^{14}	3.4×10^{14}
$\beta\ \gamma$ nuclide (Bq)	3	^{60}Co	2.0×10^{14}	9.0×10^{14}
	4	$^{90}Sr+(^{90}Y)$	1.3×10^{17}	5.0×10^{17}
	5	$^{106}Ru+(^{106}Rh)$	2.9×10^{15}	9.0×10^{15}
	6	^{134}Cs	3.7×10^{15}	2.0×10^{16}
	7	$^{137}Cs+(^{137m}Ba)$	1.4×10^{17}	1.2×10^{18}
	8	$^{144}Ce+(^{144}Pr)$	1.5×10^{15}	4.5×10^{15}
	9	^{154}Eu	6.3×10^{14}	2.5×10^{15}

Notes: When mother and daughter nuclides are in state of radiation equilibrium (j= 4, 5, 7, 8), maximum activity of mother nuclides is shown. In addition, if the quantity of the radioactivity of α nuclide per loaded vitrified residue canister is represented by weight, the specific activity of 1.268×10^{11}Bq/g (^{241}Am) and 2.993×10^{12}Bq/g (^{244}Cm) is used.

Number of Vitrified Residue Canisters*2	Up to 28 canisters	Up to 20 canisters
Heat Power	Up to 0.090kW	

*1 CSD-B: Colis Standard de Déchets Boues

*2 When total number of canisters is less than 4 per lodgment, the vacant spaces shall be filled with dummy canisters.

Table 5

Nuclide, specification, weight and radioactivity of nuclear fuel material to be contained
(Low level radioactive compacted waste canister :CSD-C*1) (Per CSD-C canister)

	When using basket for 28 canisters	When using basket for 20 canisters
Type of Content	CSD-C	
Condition	Solid	
Weight	Up to 475g (^{235}U equivalent)*2, Up to 260g (^{239}Pu equivalent)*2	
Radioactive Strength	Nuclides that emit α-ray : Up to 6.2×10^{0} TBq Nuclides that do not emit α-ray : Up to 7.4×10^{2} TBq	
The activity of main nuclides is as follows.		
Gamma Source	Maximum dose rate on surface of CSD-C	Up to 150Gy/h
	^{60}Co equivalent*3	Up to 242TBq
Neutron Source	^{244}Cm (neutron emitter)	Up to 2.0TBq
Gaseous Nuclide	^{85}Kr	Up to 4.7TBq
Number of CSD-C Residue Canisters*4	Up to 20 canisters	Up to 12 canisters
Heat Power	Up to 0.090kW	

*1 CSD-C: Colis Standard de Déchets Compactés

*2 "Equivalent" means the converted value to ^{235}U or ^{239}Pu from fissile materials (^{233}U,^{235}U,^{239}Pu and ^{241}Pu) per canister.

*3 "^{60}Co equivalent" means ^{60}Co activity corresponds to maximum surface dose rate of canister as homogeneous source model in shielding analysis of JSAR.

*4 When total number of canisters is less than 4 per lodgment, the vacant spaces shall be filled with dummy canisters.

Additionally,

- When using basket for 28 canisters, total weight of contents is up to 14,000kg.
- When using basket for 20 canisters, total weight of contents is up to 10,000kg.

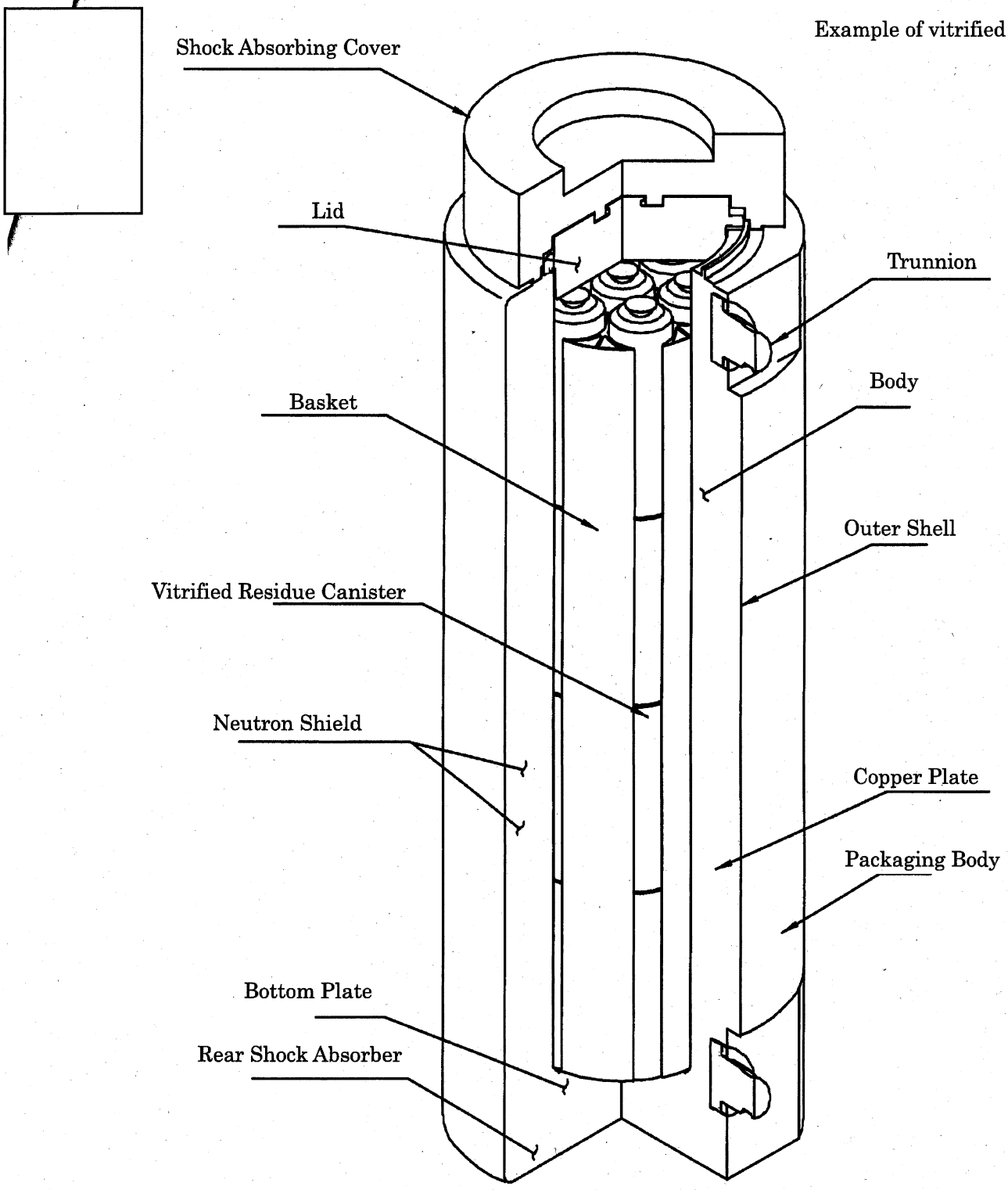

Figure 1 External appearance of transport package
(When using basket for 28 canisters)

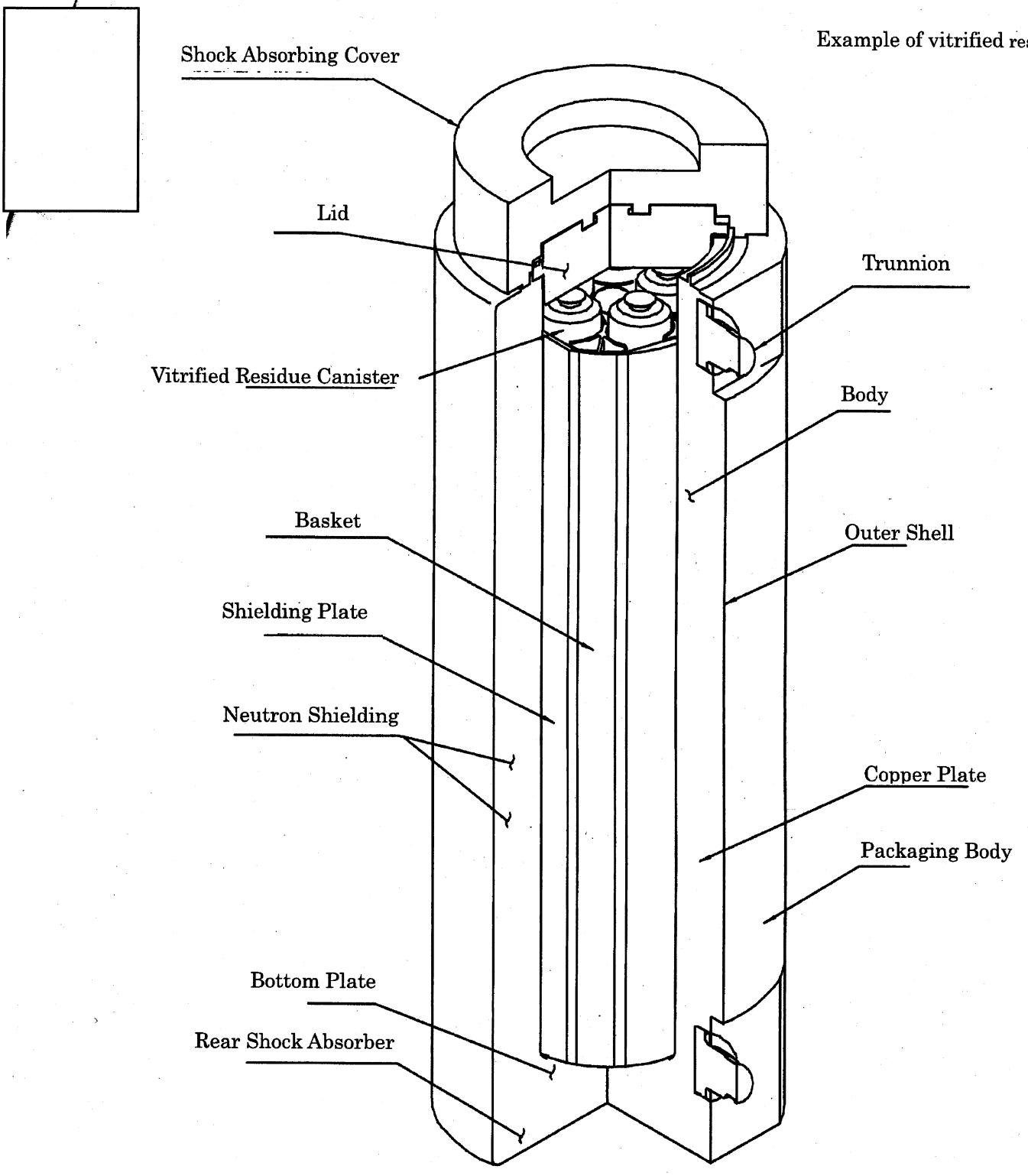

Figure 2 External appearance of transport package
(When using basket for 20 canisters)