GB/4121/B(U)F (Rev.0)

**CERTIFICATE OF APPROVAL OF PACKAGE DESIGN
FOR THE CARRIAGE OF RADIOACTIVE MATERIAL**

This is to certify that for the purposes of the Regulations of the International Atomic Energy Agency

* The Competent Authority of Great Britain in respect of inland surface transport, being the Office for Nuclear Regulation;
* The Competent Authority of the United Kingdom of Great Britain and Northern Ireland in respect of sea transport, being the Secretary of State for Transport;
* The Competent Authority of the United Kingdom of Great Britain and Northern Ireland in respect of air transport, being the Civil Aviation Authority; and
* The Competent Authority of Northern Ireland in respect of road transport, being the Department of Agriculture, Environment and Rural Affairs - Northern Ireland

approve the package design specified in Section 1 of this certificate, as submitted for approval by ROBATEL Industries (see Section 5)

as: Type B(U)F

by: road and rail in Great Britain.

Packaging identification: R82

Packages manufactured to this design meet the requirements of the regulations and codes on pages 3 and 4, relevant to the mode of transport, subject to the following general condition and to the conditions in the succeeding pages of this certificate.

In the event of any alteration in the composition of the package, the package design, the management system(s) associated with the package or in any of the facts stated in the application for approval, this certificate will cease to have effect unless the Competent Authority is notified of the alteration and the Competent Authority confirms the certificate notwithstanding the alteration.

Expiry Date: This certificate cancels all previous revisions and is valid until the end of May 2028 (see Section 5).

COMPETENT AUTHORITY IDENTIFICATION MARK: GB/4120/B(U) (Rev.0)

Signature: Date of Issue: 18 May 2023

Geoff Frackelton, Head of Transport Competent Authority

Office for Nuclear Regulation

Redgrave Court, Merton Road

Bootle, Merseyside

L20 7HS

on behalf of the Office for Nuclear Regulation; the Secretary of State for Transport; the Civil Aviation Authority; and the Department of Agriculture, Environment and Rural Affairs - Northern Ireland.

***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.***

**REGULATIONS GOVERNING THE TRANSPORT OF RADIOACTIVE MATERIALS**

**INTERNATIONAL**

International Atomic Energy Agency (IAEA)

SSR-6 Regulations for the Safe Transport of Radioactive Material 2018 Edition

United Nations Economic Commission for Europe (UNECE)

Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2021 Edition (until end June 2023) or Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2023 Edition

Intergovernmental Organisation for International Carriage by Rail (OTIF)

Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2021 Edition (until end June 2023) or Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2023 Edition

International Maritime Organization (IMO)

International Maritime Dangerous Goods (IMDG) Code 2020 Edition incorporating Amendment 40-20

International Civil Aviation Organization (ICAO)

Technical Instructions for the Safe Transport of Dangerous Goods by Air 2023-2024 Edition

**UNITED KINGDOM**

***ROAD***

GREAT BRITAIN ONLY:

The Energy Act 2013 (2013 c. 32); The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No. 1348); The Energy Act 2013 (Office for Nuclear Regulation) (Consequential Amendments, Transitional Provisions and Savings) Order 2014 (SI 2014 No. 469)

NORTHERN IRELAND ONLY:

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (Northern Ireland) 2010, (SR 2010 No 160)

***RAIL***

GREAT BRITAIN ONLY:

The Energy Act 2013 (2013 c. 32); The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No. 1348); The Energy Act 2013 (Office for Nuclear Regulation) (Consequential Amendments, Transitional Provisions and Savings) Order 2014 (SI 2014 No. 469)

***SEA***

British registered ships and all other ships whilst in United Kingdom territorial waters:

The Merchant Shipping Act 1995 (1995 c. 21); The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (SI 1997 No. 2367); Merchant Shipping Notice MSN 1906 (M) The carriage of dangerous goods and marine pollutants: Amendments to international standards

***AIR***

The Air Navigation Order 2016 (SI 2016 No. 765); The Air Navigation (Dangerous Goods) Regulations 2002 (SI 2002 No.2786)

1. DESIGN SPECIFICATION
	1. Package Design
		* 1. The package design specification shall be in accordance with R82 ANS 0001 Rev B ‘Part 0: General Summary of the PDSR’ dated 18 November 2021 (including all parts and chapters referenced in ANS 0001), and modifications to the package design approved by the authorities named on page 1 of this certificate under the established modifications procedure.
	2. Design Drawings
		* 1. The design is specified in the following drawings.

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| --- | --- | --- | --- |
| **Design No.** | **Title (number of components)** | **Drawing / Drawing List** | **Issue** |
| R82 | Design Drawing R82 Flask (1)  | R82 PC 0001 | C |
| R82 | Design Drawing MEB Multi Element Bottle R82 FLASK (1) | R82 PC 0011 | D |
| R82 | General Arrangement MEB Basket R82 Flask (1)  | R82 PC 0021 | B |
| R82 | General Arrangement Irradiated Fuel Container Mark II PFR (1) | 2Z291302 | B |
| R82 | Multi Detail Drawing Irradiated Fuel Container Mark II PFR (1) | 1Z291300 | B |
| R82 | Detail Drawing IF Container Mark II Body PFR (1) | 1Z291303 | B |
| R82 | Design Drawing IFC Loading Configurations R82 Flask (1) | R82 PC 7001 | A |

* 1. Package Description and Materials of Manufacture
		+ 1. The R82 is a cylindrical package designed to be transported horizontally by road and rail and to be operated vertically. It is composed of; a stainless-steel basket that accommodates Irradiated Fuel Containers; a stainless-steel cylindrical Multi-Element Bottle (MEB) that is sealed by the primary closure lid; Compound 23 (CP23) axial neutron protection which is positioned over the MEB when loaded inside the flask cavity; the flask body which integrates the main mechanical, thermal and shielding protection (stainless-steel, PNT7 TM and refined lead); a stainless-steel secondary closure lid that seals the cavity of the flask body with two concentric EPDM O-ring seals including an integrated stainless-steel cover plate for impact protection; and two impact limiters composed of PNT7TM and wood within a stainless-steel case that are fixed on the extremities of the flask’s body. See Appendix 1 for package illustration.
	2. Package Dimension and Weights
		+ 1. Nominal dimensions: length 4,657 mm, diameter 2,300 mm (including impact limiters)
			2. Maximum authorised gross weight: 46,600 kg
	3. Authorised Contents
		+ 1. The radioactive contents authorised to be transported under this certificate of approval (as specified in Part 1 Chapter 2 of the package design safety report stated in section 1.1 of this certificate) are:
1. Content 1 – up to 9 Irradiated Fuel Containers (IFC), each containing 1 truncated PFR core fuel sub-assembly or 1 PFR radial breeder sub-assembly

and

1. Content 2 – up to 9 Irradiated Fuel Containers, each containing loose PFR fuel rods held within a quiver.
	* + 1. The contents must have no more than:
			- total mass within one IFC of 270 kg;
			- total activity of 2.52 x 105 A2 / IFC;
			- total activity of 2.27 x 106 A2 / package;
			- maximum specific activity of oxides of 4.616 x 103 A2 / kg;
			- maximum 3H activity of 2.11 TBq / IFC;
			- maximum 85Kr activity of 12.57 TBq / IFC;
			- thermal output of 200 W / IFC;
			- thermal output of 1,800 W / package.
			1. Mixing of irradiated oxide PFR core fuel sub-assemblies and irradiated oxide PFR radial breeder sub-assemblies in a single MEB is allowed.
			2. Mixing of Content 1 and Content 2 within a single MEB is allowed.
	1. Restriction on Contents
		* 1. The sub-assemblies that can be transported under this certificate are listed in Appendix D of ANS 0201 Rev B of the package design safety report referenced in paragraph 1.1 of this certificate.
	2. Containment System
		* 1. The R82 flask design includes two independent containment enclosures as follows:
2. The primary containment enclosure (MEB) that is sealed by the primary closure lid.
3. The secondary containment enclosure (flask) which is composed of the flask’s inner cavity, the stainless-steel flask lid (secondary lid), the inner EPDM O-ring of the flask lid, the stainless-steel cover plate of the flask lid and the inner EPDM O-ring of the cover plate.
	1. Fissile Material Restrictions
		* 1. Unless the contents of the package and/or consignment meet the provision of paragraphs 417, 674 or 675 of IAEA SSR-6, the packages shall comply with the following fissile material approval.
		1. Fissile material approval for Content 1
			1. Fissile material:
				1. Maximum plutonium content in fuel stack is Pu / (Pu + U) = 34 wt %
				2. Maximum 239Pu content in fuel stack is 239Pu / Putot = 81 wt %
				3. Maximum 235U enrichment of the Upper and Lower Axial Breeder sections is 0.72 wt %
				4. Maximum total length of fuel stack and axial breeder sections is 163 cm
				5. Maximum length of fuel stack is 92 cm
				6. Maximum linear weight of heavy metal (uranium + plutonium) in fuel stack is 570 g/cm
				7. Maximum linear weight of heavy metal (uranium) in the axial breeder sections is 650 g/cm
				8. Minimum linear weight of stainless-steel cladding is 165 g/cm
		2. Fissile material approval for Content 2
			1. Fissile material:
				1. Maximum plutonium content in fuel stack is Pu / (Pu + U) = 34 wt %
				2. Maximum 239Pu content in fuel stack is 239Pu / Putot = 81 wt %
				3. Maximum 235U enrichment of the Upper and Lower Axial Breeder sections is 0.72 wt %
				4. Maximum total length of fuel stack and axial breeder sections is 163 cm
				5. Maximum length of fuel stack is 92 cm
				6. Maximum linear weight of heavy metal (uranium + plutonium) in fuel stack is 375 g/cm
				7. Maximum linear weight of heavy metal (uranium) in the axial breeder sections is 427 g/cm
				8. Minimum linear weight of stainless-steel cladding is 108 g/cm
			2. Conditions:
				1. Compliance with the fissile mass limits for the package shall be on the basis of pre-irradiation contents, with no account being taken of fuel burnup. The presence of other fissile and fissionable nuclides produced by fuel irradiation need not be included.
				2. No free liquids or moderators are allowed within the package.
			3. The confinement system of the R82 package is composed of the radioactive material, the Irradiated Fuel Containers, the basket which is used for loading the content inside the MEB, the MEB and primary closure lid, the axial neutron protection (made of the compound ROBATEL CP23™) and the flask’s body (including its secondary closure lid).
			4. Criticality Safety Index (CSI) = 0
			5. The criticality safety documentation comprises Part 2 Chapter 16 of the package design safety report referenced in paragraph 1.1 of this certificate ANS 1601 Rev A ‘Safety Criticality Analysis: Compliance with the Criticality Requirements’.
			6. The design incorporates special features to prevent leakage of water into or out of void spaces. These special features (two independent containment enclosures described in paragraph 1.11 of this certificate) constitute a multiple high standard water barrier design as described in paragraph 680 of SSR-6 2018.
			7. The ambient temperature range for which the package design has been approved is -40ºC to +38ºC.
			8. Air transport restrictions:

a) This package shall not be transported by air.

1. use of package
	1. Information Provided in Safety Report on Use of Packaging
		* 1. The packaging shall be used and handled in accordance with R82 ANS 0601 Rev C ‘Operation Instructions’ dated 13 September 2021.
			2. The packaging shall be maintained in accordance R82 ANS 0701 Rev C ‘Maintenance Instructions’ dated 13 September 2021.
	2. Actions Prior to Shipment
		* 1. Administrative controls shall ensure that the contents are in accordance with Section 1 of this certificate, and that the consignor and consignee hold a copy of the certificate and instructions on the use of the packaging.
	3. Supplementary Operational Controls
		* 1. The package should be transported under exclusive use.
	4. Emergency Arrangements
		* 1. Before shipment takes place, adequate emergency arrangements must be made, copies of which shall be supplied to the GB Competent Authority on demand.
			2. Within Great Britain, if the consignor’s own, or other approved emergency plans, cannot be initiated for any reason, then the police shall be informed immediately.
2. management systems
	* + 1. The management system(s) assessed as adequate in relation to this design by the authorities named on page 1 of this certificate, at the date of issue, are as specified in Part 1, Chapter 8 of the package design safety report referenced in section 1.1 of this certificate, and comprise the following:
* QSE MAQ Rev 25 ‘Manuel Qualité’ dated 21 November 2022 (ROBATEL Industries Quality Management System)
	+ - 1. No alteration may be made to any management system confirmed as adequate in relation to this design, unless:
				1. the authorities named on page 1 of this certificate have confirmed the amended management system is adequate prior to implementation or use; or
				2. the alteration falls within the agreed change control procedures set out in the management system(s).
			2. Other management systems for design, testing, manufacture, documentation, use, maintenance, inspection, transport and in-transit storage operations may be used providing they comply with international, national or other standards for management systems agreed as acceptable by the authorities named on page 1 of this certificate.
1. ADMINISTRATIVE INFORMATION
	1. Packaging Serial Numbers
		* 1. For the purpose of compliance with ADR / RID, the owner of the packaging shall be responsible for informing ONR of the serial number of each packaging manufactured to this design.
2. CERTIFICATE STATUS
	1. Design approval issued to:

ROBATEL Industries

12 rue de Genève – CS 80011

69747 Genas Cedex

FRANCE

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| --- | --- | --- | --- |
| **Issue / Revision Number** | **Date of Issue** | **Date of Expiry** | **Reason for Revision** |
| 0 | XX May 2023 | 31 May 2028 | First Issue |
|  |  |  |  |

Appendix 1 – package illustration

