IDENTIFICATION MARK
J/170/B(U)F-96 (Rev. 3)

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 KYOTO UNIVERSITY, that the package design described herein complies with the design requirements for a package containing fresh fuel elements and low irradiated fuel elements in research reactors, 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
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Jun. 23. 2020.
Date

K. Hasegawa
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/170/B(U)F-96(Rev. 3)

2. Name of Package : JRF-90Y-950K

3. Type of Package : Type B(U) package for fissile material

4. Specification of Package
   (1) Materials of Packaging
      (a) Main Body : Stainless steel, Balsa wood and Hard polyurethane foam
      (b) Outer lid : Stainless steel, Balsa wood and Hard polyurethane foam
      (c) Inner lid : Stainless steel and Silicone rubber
      (d) Fuel Basket : Stainless steel and Silicone rubber
   (2) Total weight of Packaging : Approximately 860 kg
   (3) Outer Dimensions of Packaging
      (i) Outer Diameter : Approximately 840 mm
      (ii) Length : Approximately 1,800 mm
   (4) Total Weight of Package : 950 kg or less
   (5) Illustration of Package : See the attached Figure-1 (Bird's-eye View)

5. Specification of Radioactive Contents : See the attached Table-1, 2, 3 and 4

6. Description of Containment System
   Containment system consists of the inner shell and the inner lid (made of the stainless steel). O-ring made of silicone rubber is used for the contact surface between inner shell and inner lid.

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

Confinement system consists of the basket which maintains the fuel elements contained in the package.

(3) Assumptions of Leakage of Water into Package
It is assumed in criticality analysis that water will leak into void space of inner shell.

(4) Special Features in Criticality Assessment
Not applicable

8. For Type B (M) Packages, a statement regarding prescriptions of Type B (U) Package that do not apply to this Package
Not applicable (This package is Type B(U))

9. Assumed Ambient Conditions
(i) Ambient Temperature Range : -40°C~38°C
(ii) Insolation Data : Table 12 of IAEA Regulation

10. Handling, Inspection and Maintenance
(1) Handling Instructions
(i) Package should be handled carefully in accordance with the schedule and procedures established properly taking all possible safety measures.
(ii) Package should be handled using appropriate lifting devices and the crane.
(iii) When packaging is stored outdoors, it should be coverd with an appropriate waterproof sheet, avoiding the situation where it is placed directly on the ground.

(2) Inspections and Maintenance of Packaging
The following inspections should be performed not less than once a year (once for every ten times in a case where the packaging is used not less than ten times a year) and defect of packaging should be repaired, if any, in order to maintain the integrity of packaging.
(i) Visual Appearance Inspection
(ii) Pressure Durability Inspection
(iii) Maintenance of O-ring Used for Containment System
(iv) Leakage Rate Measurement Inspection
(v) Subcriticality Inspection
(vi) Lifting Inspection

(3) Actions prior to Shipment
The following inspections should be performed prior to shipment.
(i) Visual Appearance Inspection

(ii) Lifting Inspection
(iii) Weight Measurement Inspection
(iv) Surface Cointamination Measurement Inspection
(v) Radiation Dose rate Inspection
(vi) Subcriticality Inspection
(vii) Contents Specification Check Inspection
(viii) Leakage Rate Measurement Inspection

(4) Precautions for Loading of Package for Shipment
Package should be securely loaded to the conveyance at the designated tie-down portion of the package 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 : April 27, 2020
(ii) Expiry Date : April 26, 2025

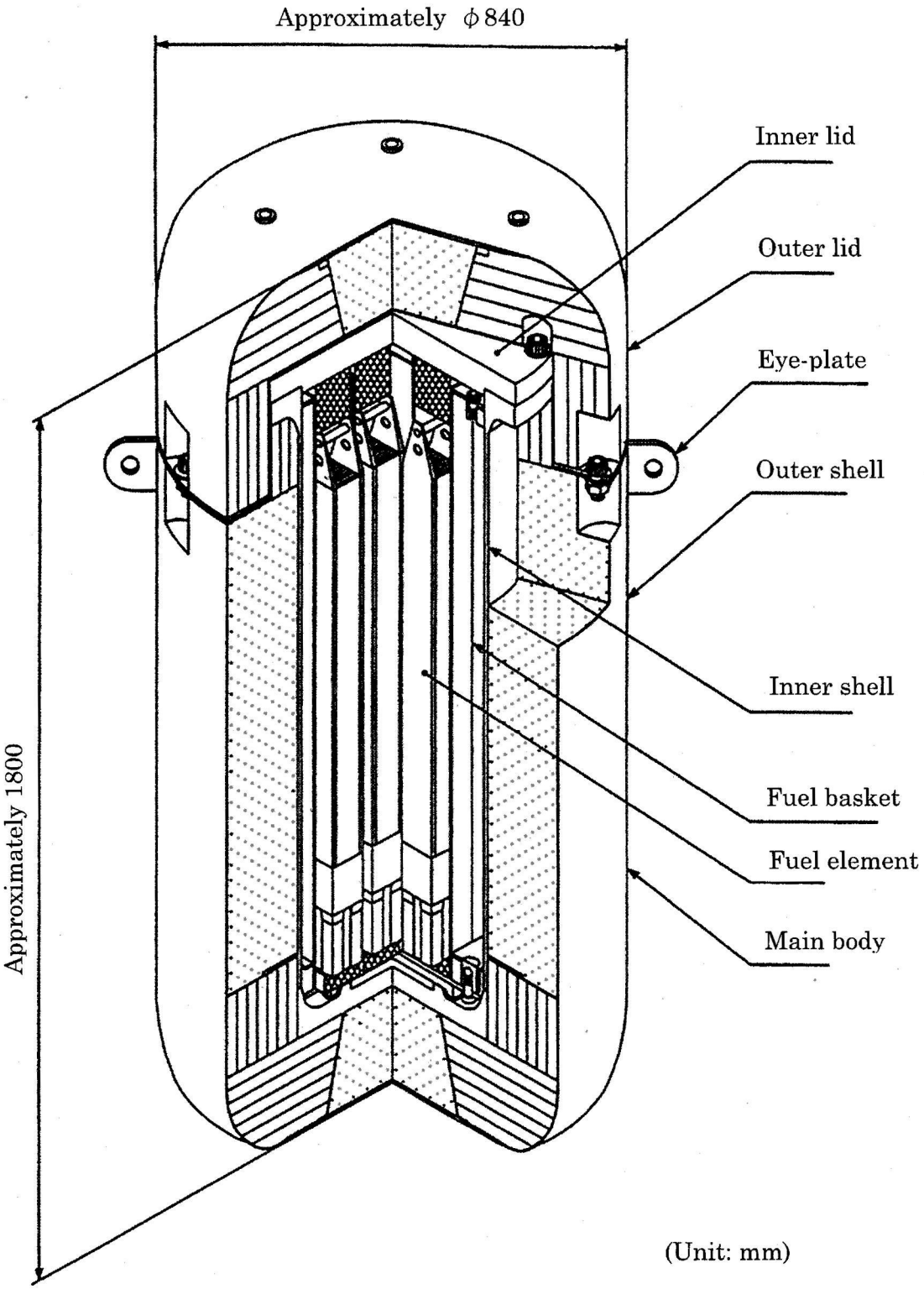

Figure-1 Illustration of JRF-90Y-950K package (Bird's-eye view)

Table-1 Specification of Contents (Fresh Fuel Element)

Reactor		KUR (Kyoto University Research reactor)		
Fuel Element		KUR Standard Fuel Element	KUR Special Fuel Element	KUR Half-loaded Fuel Element
Number of Fuel Elements (element/package)		10 or less		
Fuel Type		LEU fuel		
Materials of Nuclear Fuel		Uranium-silicon -aluminum dispersion alloy		
Weight	^{235}U weight (g or less/package)	2,180	1,090	1,090
	U weight (g or less/package)	11,150	5,580	5,580
	^{235}U weight (g or less/element)	218	109	109
	U weight (g or less/element)	1,115	558	558
Enrichment (wt% or less)		19.95		
Activity of Contents	Total (GBq or less/package)	29.8		
	Principal Radionuclide (GBq or less/package)	^{234}U : 28.6 ^{235}U : 0.38 ^{236}U : 0.59 ^{238}U : 0.24		
Physical State		Solid		
Burn-up (% or less)		0 (Fresh Fuel)		
Total Heat Generation Rate (W or less/package)		0 (Fresh Fuel)		
Cooling Time (days)		0 (Fresh Fuel)		

-Loading a transport package with different types of nuclear fuel material is allowed for each reactor only when all the fuel elements contained are the same type having the same enrichment level.For the nuclear fuel material from JMTRC, however, mixed loading of fuel elements of different types and different enrichment levels is allowed.

- The values of weight and heat generation are calculated proportionally from the maximum weight and heat generation for each type of fuel element according to the number of assemblies contained.

Table-2 Specification of Contents (Fresh Fuel Element)

Reactor		JRR-3		JRR-4			JMTR		
Fuel Element		JRR-3 standard fuel element	JRR-3 follower type fuel element	JRR-4B type fuel element	JRR-4L type fuel element	JRR-4 type fuel element	JMTR standard fuel element		JMTR fuel followers
Number of Fuel Elements (element/package)		10 or less							
Fuel Type		LEU fuel		HEU fuel	LEU fuel		MEU fuel	LEU fuel	
Materials of Nuclear Fuel		Uranium-silicon - aluminum dispersion alloy		Uranium - aluminum alloy	Uranium-aluminum dispersion alloy	Uranium-silicon - aluminum dispersion alloy	Uranium-aluminum dispersion alloy	Uranium-silicon - aluminum dispersion alloy	
Weight	^{235}U weight (g or less/package)	4,850	3,100	1,700	2,300	2,100	3,200	4,250	2,800
	U weight (g or less/package)	24,810	15,860	1,830	11,770	10,750	7,280	21,740	14,330
	^{235}U weight (g or less/element)	485	310	170	230	210	320	425	280
	U weight (g or less/element)	2,481	1,586	183	1,177	1,075	728	2,174	1,433
Enrichment (wt% or less)		19.95		93.3	19.95		46.0	19.95	
Activity of Contents	Total (GBq or ess/package)	29.8							
	Principal Radionuclide (GBq or less/package)	^{234}U : 28.6 ^{235}U : 0.38 ^{236}U : 0.59 ^{238}U : 0.24							
Physical State		Solid							
Burn-up (% or less)		0 (Fresh Fuel)							
Total Heat Generation Rate (W or less/package)		0 (Fresh Fuel)							
Cooling Time (days)		0 (Fresh Fuel)							

-Loading a transport package with different types of nuclear fuel material is allowed for each reactor only when all the fuel elements contained are the same type having the same enrichment level.For the nuclear fuel material from JMTRC, however, mixed loading of fuel elements of different types and different enrichment levels is allowed.

- The values of weight and heat generation are calculated proportionally from the maximum weight and heat generation for each type of fuel element according to the number of assemblies contained.

Table-3 Specification of Contents (Low Irradiated Fuel Element)

Reactor		JMTRC					
Fuel Element		JMTRC Standard	JMTRC Special	JMTRC Follower	JMTRC Standard	JMTRC Special	JMTRC Follower
Number of Fuel Elements (element/package)		10 or less					
Fuel Type		HEU fuel			MEU fuel		
Materials of Nuclear Fuel		Uranium-aluminum alloy			Uranium-aluminum dispersion alloy		
Weight	^{235}U weight (g or less/package)	2,850		1,990	3,170	2,860	2,100
	U weight (g or less/package)	3,180		2,220	7,210	6,500	4,780
	^{235}U weight (g or less/element)	285		199	317	286	210
	U weight (g or less/element)	318		222	721	650	478
Enrichment (wt% or less)		90.0			46.0		
Activity of Contents	Total (GBq or ess/package)	17.3					
	Principal Radionuclide (GBq or less/package)	^{234}U : 16.2 ^{235}U : 0.25 ^{236}U : 0.29 ^{238}U : 0.05 Others : 0.52					
Physical State		Solid					
Burn-up (% or less)		7.23×10^{-5}			1.76×10^{-5}		
Total Heat Generation Rate (W or less/package)		4.30×10^{-5}			3.29×10^{-5}		
Cooling Time (days)		5,475 or more			1,460 or more		

-Loading a transport package with different types of nuclear fuel material is allowed for each reactor only when all the fuel elements contained are the same type having the same enrichment level.For the nuclear fuel material from JMTRC, however, mixed loading of fuel elements of different types and different enrichment levels is allowed.

- The values of weight and heat generation are calculated proportionally from the maximum weight and heat generation for each type of fuel element according to the number of assemblies contained.

Table-4 Specification of Contents (Fresh Fuel Element)

Reactor		KUCA (Kyoto University Critical Assembly)	
Fuel Element		Coupon	Flat
Number of Fuel Elements (element/package)		1,200 or less	300 or less
Fuel Type		LEU Fuel	
Materials of Nuclear Fuel		Uranium-molybdenum - aluminum dispersion alloy	Uranium-silicon - aluminum dispersion alloy
Weight	^{235}U weight (g or less/package)	4,800	4,500
	U weight (g or less/package)	24,600	23,400
	^{235}U weight (g or less/element)	4	15
	U weight (g or less/element)	20.5	78
Enrichment (wt% or less)		19.95	
Activity of Contents	Total (GBq or less/package)	15.5	
	Principal Radionuclide (GBq or less/package)	^{234}U : 14.5 ^{235}U : 0.38 ^{236}U : 0.27 ^{238}U : 0.24	
Physical State		Solid	
Burn-up (% or less)		0 (Fresh Fuel)	
Total Heat Generation Rate (W or less/package)		0 (Fresh Fuel)	
Cooling Time (days)		0 (Fresh Fuel)	

-Loading a transport package with different types of nuclear fuel material is allowed for each reactor only when all the fuel elements contained are the same type having the same enrichment level.For the nuclear fuel material from JMTRC, however, mixed loading of fuel elements of different types and different enrichment levels is allowed.

- The values of weight and heat generation are calculated proportionally from the maximum weight and heat generation for each type of fuel element according to the number of assemblies contained.