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

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

COMPETENT AUTHORITY CERTIFICATION FOR A TYPE FISSILE RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/0776/AF-96, REVISION 1

REVALIDATION OF FRENCH COMPETENT AUTHORITY CERTIFICATE F/347/AF-96

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 AF 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 - FCC-3 Transport Package.

2. Package Description and Authorized Radioactive Contents - as described in French Certificate of Competent Authority F/347/AF-96, Revision Fs (attached).

3. Criticality - The minimum criticality safety index is as assigned in French Certificate of Approval. The maximum number of packages per conveyance is determined in accordance with Table 11 of the IAEA regulations cited in this certificate.

4. 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

[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.

Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

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.

5. Special Conditions - Transport by air is not allowed.

6. Marking and Labeling - The package shall bear the marking USA/0776/AF-96 in addition to other required markings and labeling.

7. Expiration Date - This certificate expires on April 30, 2023.

This certificate is issued in accordance with paragraph(s) 816 of the IAEA Regulations and Section 173.472 and 173.473 of Title 49 of the Code of Federal Regulations, in response to the December 12, 2019 petition by TN Americas LLC, Columbia, MD, and in consideration of other information on file in this Office.

Certified By:

William Schoonover
Associate Administrator for Hazardous Materials Safety

March 17, 2021
(DATE)

Revision 1 - Issued to revalidate French Certificate of Approval No. F/347/AF-96, Revision Fs.

AUTORITÉ DE SÛRETÉ NUCLÉAIRE

TRANSPORT AND RESOURCES DEPARTMENT

APPROVAL CERTIFICATE FOR PACKAGE DESIGN

The French Competent Authority,

Pursuant Article L. 595-1 of the Environment Code;

Pursuant to the request presented by the company **TN International** by letter COR-19-016933-015 dated 22 February 2019;

Pursuant to the safety analysis report DOS-18-016471-000 version 1.0, dated 20 February 2019;

Pursuant to the previously issued certificate, under reference F/347/IF-96 (Fr);

Certifies that the package model, constituted by the **FCC3** packaging, described below in appendix **0** at version s, and loaded with one of the following contents:

- a maximum of 2 new PWR 17x17 twelve-foot fuel assemblies, in Version 1 of the packaging, as described in Appendix 1 at version s;
- or, a maximum of 2 new PWR 15x15 fuel assemblies, in Version 1 of the packaging, as described in Appendix 2 at version s;
- or, a maximum of 2 new PWR 14x14 8-foot fuel assemblies, in Version 2 of the packaging, as described in Appendix 3 at version s;
- or, a maximum of 2 new PWR 14x14 10-foot fuel assemblies, in Version 2 of the packaging, as described in Appendix 4 at version s;
- or, a maximum of 2 boxes, containing new PWR 17x17 twelve-foot non-assembled fuel rods, in Version 1 of the packaging, as described in Appendix 5 at version s;
- or, a maximum of 2 boxes, containing new PWR 15x15 non-assembled fuel rods, in Version 1 of the packaging, as described in Appendix 6 at version s;
- or, a maximum of 2 boxes, containing new PWR 14x14 8-foot non-assembled fuel rods, in Version 1 of the packaging, as described in Appendix 7 at version s;
- or, a maximum of 2 boxes, containing new PWR 14x14 10-foot non-assembled fuel rods, in Version 1 of the packaging, as described in Appendix 8 at version s;

conforms to the requirements and regulations, agreements and recommendations for **type A packages loaded with fissile materials** listed below:

- regulations for the safe transport of radioactive material, IAEA Safety Standards series, No. SSR-6, 2012 edition;
- European Agreement on the International Carriage of Dangerous Goods by Road (ADR);
- regulations governing International Rail Transportation of Dangerous Goods (RID);
- European Agreement on the International Carriage of Dangerous Goods by inland waterways (ADN);
- International maritime code for dangerous goods (IMDG code of the IMO);
- Decree dated 29 May 2009 (modified) concerning the Carriage of Dangerous Goods by Terrestrial Routes (TMD Order);
- Decree dated 23 November 1987 (modified) concerning the safety of ships, division 411 (RSN Order).

This certificate does not relieve the consignor from compliance with any requirements drawn up by the government of any country through or towards which the package will be transported. This Approval Certificate may be appealed, before the competent jurisdiction, within a period of two months from the date of its signature.

This certificate expires on **30 April 2023**

Registration number: **CODEP-DTS-2019-026916**

Signed in Montrouge, 14 August 2019

For the President of the ASN and by delegation,
the Director for Transportation and Sources

Fabien FÉRON

SUMMARY OF CERTIFICATE VERSIONS

Issue	Expiry	Type of issue and modifications made	Authority	Type of certificate	Revision index														
					Body	t	0	1	2	3	4	5	6	7	8	9	10	11	12
31/01/00	31/01/05	Initial approval	DGSNR	F/347/IF-85	Aa	-	a	a	a	a	a	-	-	-	-				
27/11/02	31/01/05	Extension	DGSNR	F/347/IF-85	Ab	-	b	-	-	b	b	-	-	-	-				
12/02/04	31/01/05	Extension	DGSNR	F/347/IF-85	Ac	-	c	c	c	c	c	-	-	-	-				
30/12/04	31/01/10	Renewal	DGSNR	F/347/IF-96	Bd	-	d	d	d	d	d	d	d	d	d				
20/07/05	31/01/10	Extension	DGSNR	F/347/IF-96	Be	-	e	e	e	e	e	e	e	e	e				
02/10/06	31/01/10	Extension	DGSNR	F/347/IF-96	Bf		e	e	e	e	e	e	e	e	e	f	f	f	f
15/07/09	31/12/10	Renewal	ASN	F/347/IF-96	Cg	-	e	g	g	g	g	g	e	e	e	f	f	f	f
31/08/09	31/12/10	Extension	ASN	F/347/AF-96	Ch	-	e	g	g	g	g	g	g	g	g	g	g	g	g
11/09/09	31/12/10	Renewal	ASN	F/347/AF-96	Ci	-	f	h	h	h	h	h	g	g	g	g	g	g	g
13/01/10	31/12/10	Extension	ASN	F/347/IF-96	Cj	-	j	j	j	j	j	j	h	h	h	h	h	h	h
04/10/10	30/09/13	Renewal	ASN	F/347/IF-96	Dk	-	k	k	k	k	k	k	j	j	j	-	-	-	-
04/10/10	30/09/13	Renewal	ASN	F/347/AF-96	Dl	-	l	l	l	l	l	l	k	k	k	-	-	-	-
02/05/13	30/04/18	Renewal	ASN	F/347/IF-96	Em	-	m	m	m	m	m	m	l	l	l	-	-	-	-
06/02/13	30/04/18	Extension	ASN	F/347/IF-96	En	-	m	n	-	-	-	-	m	m	m	-	-	-	-
10/04/14	30/04/18	Extension	ASN	F/347/IF-96	Eo		m	o											
18/01/16	30/04/18	Extension	ASN	F/347/IF-96	Ep	-	p	-	p	p	p								
11/12/17	30/04/23	Renewal	ASN	F/347/IF-96	Fq	-	q	q	q	q	q	q	-	-	-	-	-	-	-
29/12/17	30/04/23	Modifications	ASN	F/347/IF-96	Fr	-	r	q	q	q	q	q	q	q	q	-	-	-	-
14/08/19	30/04/23	Extension	ASN	F/347/AF-96	Fs	-	s	s	s	s	s	s	s	s	s	-	-	-	-

APPENDIX 0

FCC3 PACKAGING

1. PACKAGING DEFINITION

The packaging was designed, manufactured, inspected, tested, maintained and used in compliance with the Safety Analysis Report DOS-18-016471 version 1.0.
The packaging, of a generally cylindrical form, is presented in Figure 0.1.
The packaging design drawings are 229K0100, 229K0200 and 229K0700 for Version 1 and 229K0300 for Version 2.
The overall external dimensions of the packaging are:

- length: 4,931 mm;
- width: 1,145 mm;
- height: 1,217 mm.

The maximum permissible mass of the packaging, loaded for transport, is 4,385 kg.
The packaging comprises the following principal sub-assemblies:

1.1 Body

The FCC3 packaging comprises a horizontal cylindrical casing, which, in turn, comprises two connected half-shells, holding:

- a metallic cradle consisting of two stringers and suspended by means of shock mounts from the lower shell;
- internal equipment fitted to the cradle and designed to accommodate one of the types of content.

This internal equipment comprises:

- A support frame, whose rigid structure, in the form of an inverted "T", is designed to hold the contents horizontally. The fabricated part of the frame contains neutron-absorbing resin. A tilting mechanism at the bottom plate is used to rotate the support frame to a vertical position for loading and unloading of fuel assemblies;
- two L-shaped doors, filled with neutron-absorbing resin, which are attached to the support frame and used to enclose the contents;
- a bottom plate, to support the fuel assemblies when loading or unloading when the support frame is in a vertical position;
- a two-part top plate used to close off the cavities and to wedge the contents at the other end.

1.2 Closing system

The two cylindrical half-shells are connected using 30 bolts.
The doors and top plates are connected to the frame using hinge pins and ball locking pins. The bottom plate is screwed to the frame.

1.3 Shock absorbing systems

Two axial shock absorbers are fitted to the end of the upper shell. They are made up of two metallic boxes containing a block of balsa wood.
Two additional axial shock-absorbers are fixed on the top plates when transporting assemblies with RCCA.

1.4 Handling and tie-down components

Handling can be performed using standard lifting machinery, with the aid of an appropriate lifting beam or slings fitted with shackles or hooks.
Two lifting modes are possible:

- using the 4 lifting boxes welded to the upper shell: these lifting boxes are composed of folded sheet metal with a hole for passing a shackle or a hook;

– using the passages for the forks located under the lower shell.

In addition, the packaging is designed to be lashed down during transport, as per the requirements laid out in Chapter 1.7 of DOS-12-00057684-070 Rev. 1 of the Safety Analysis Report.

1.5 Safety functions

– **Criticality protection is provided by** the elements identified in the appendices describing the contents, such as the insulation system, and in terms of the packaging, the elements below:

  - The internal equipment: comprising the frame, doors and end plates, as well as radial and axial supports for the fuel rod boxes and the fuel rod boxes themselves, with the assembly as a whole forming two neutron cavities;
  - The neutron-absorbing resin placed in the doors and frame;
  - The top and bottom shells protecting the internal system during normal and accidental transport conditions (NCT and ACT).

– **The fuel is protected from shocks**, principally, by the two half-shells and the internal equipment system.

– **Fire protection is provided, principally, by** the two half-shells, the internal fittings and the resin contained within the doors and frame.

2. ACTIONS TO BE TAKEN BY THE SHIPPER PRIOR TO DISPATCH OF THE PACKAGE

The packaging must be used in line with applicable procedures, in compliance with the instructions for use in Chapter 1.7 of DOS-12-00057684-070 Rev. 1 of the Safety Analysis Report.

The sender must check that, for all screws providing a security function of Class 10.9 or higher, the surface treatment has been carried out, in accordance with the following precautions:

- The surface is not prepared by etching prior to treatment, unless the pickled surface has been neutralized;
- Degassing, starting 3 hours or less after the completion of the surface treatment work.

3. MAINTENANCE PROGRAM

The packaging is subject to maintenance in accordance with the provisions described in the Chapter 1.8 of DOS-12-00057684-080 Rev. 1 of the Safety Analysis Report.

Any packaging that does not satisfy the criteria given in the Maintenance Program must be taken out of service until the appropriate corrective action has been carried out.

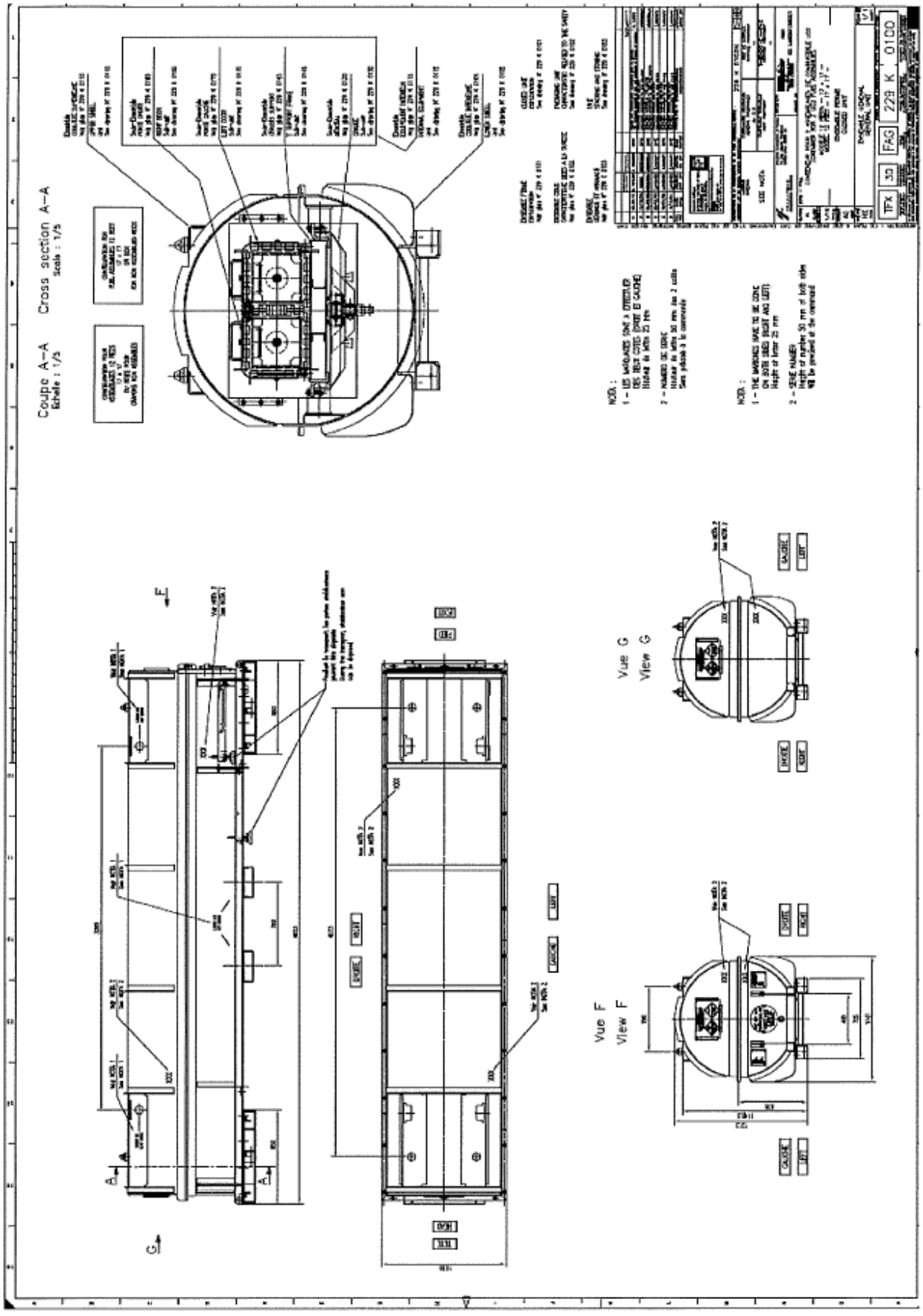
4. NOTIFICATION AND RECORDING OF SERIAL NUMBERS

If any packaging is retired from service or changes owner, this must be reported to the competent authorities. To this end, the owner transferring the packaging will provide the name of the new owner.

5. QUALITY MANAGEMENT SYSTEM

The principles of the quality management system applied during the design, manufacture, inspection, testing, maintenance and use of the package must comply with those described in Chapter 1.9 - Ref. DOS-12-00057684-090 Rev. 0 of the Safety Analysis Report.

FIGURE 0.1
PACKAGING ARRANGEMENT DRAWING



APPENDIX 1

CONTENT NO. 1

FRESH 17x17 PWR TWELVE-FOOT FUEL ASSEMBLIES

The contents should be loaded into an FCC 3 Version 1 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel assemblies

The authorized radioactive contents, as described in Chapter 1.3 - Ref. DOS-18-016471-006 version. 1.0 of the Safety Analysis Report, comprise a maximum of two fresh fuel assemblies, designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	17x17
Nominal grid pitch [mm] Length (foot)	12.6 12
Maximum total weight of assembly, with or without RCCA (kg)	757
Maximum UO_2 weight per assembly (kg)	591
Nominal active length (mm)	3,658
Maximum number of fuel rods	288 (1)
Characteristics of the fuel rods before irradiation:	
Cladding:	
- Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.52
- Minimum outer diameter (mm)	9.40
Pellets:	ENU (2)
- Maximum diameter (mm)	8.30
- Maximum oxide density (100% of theoretical density)	10.96
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This number corresponds to the maximum number of rods likely to be inserted into the structure (carcass or assembly framework), including into guide tubes.
(2) ENU: enriched natural uranium

Residue of glycerin (a maximum of 5 grams) may be present on each of the assemblies or on the mock-up assembly.

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All assemblies making up a load must adhere to the conditions defined in the table below.

Type of assembly	Maximum number of assemblies authorized for a load	Maximum initial enrichment level per rod ($^{235}U/U_{total}$) (%)	Minimum number of rods in each loaded assembly (1)
17x17	2	5	264

(1) Incomplete UO_2 fuel rod assemblies can be completed using gadolinium rods or rods containing depleted uranium or other metallic materials, or even by solid metallic rods (graphite & beryllium not included) which may contain neutron absorbers. These additional rods or bars will have dimensions equivalent to the UO_2 rods. By "number of rods per assembly", we mean the total number of fuel rods and replacement rods or bars.

All assemblies included in a load, bar one, can be replaced by dummy assemblies.
The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical State: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison with a mixture density of not more than 10.96 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. MAINTAINING SUB-CRITICALITY

The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-1 DOS-12-00057682-501 Rev. 0.

Criticality-Safety Index (CSI): 0.625 (Number N=80)

APPENDIX 2

CONTENTS N°2

FRESH 15x15 PWR FUEL ASSEMBLIES

The contents should be loaded into an FCC 3 Version 1 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel assemblies

The authorized radioactive contents, as described in Chapter 1.3 - Ref. DOS-18-016471-006 version 1.0 of the Safety Analysis Report, comprise a maximum of two fresh fuel assemblies, designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	15x15
Nominal grid pitch (mm)	14.3
Maximum total weight of assembly, with or without RCCA (kg)	749
Maximum UO_2 weight per assembly (kg)	589
Nominal active length (mm)	3,658
Maximum number of fuel rods	224 (1)
Characteristics of the fuel rods before irradiation:	
Cladding: - Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.57
- Minimum outer diameter (mm)	10.68
Pellets:	ENU (2)
- Maximum diameter (mm)	9.4
- Maximum oxide density (100% of theoretical density)	10.96
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This number corresponds to the maximum number of rods likely to be inserted into the structure (carcass or assembly framework), including into guide tubes.

(2) ENU: Enriched natural uranium

Residue of glycerin (a maximum of 5 grams) may be present on each of the assemblies.

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All assemblies making up a load must adhere to the conditions defined in the table below.

Type of assembly	Maximum number of assemblies authorized for a load	Maximum initial enrichment level per rod ($^{235}U/U_{total}$) (%)	Minimum number of rods in each loaded assembly (1)
15x15	2	5	204

(1) Incomplete UO_2 fuel rod assemblies can be completed using gadolinium rods or rods containing depleted uranium or other metallic materials, or even by solid metallic rods (graphite & beryllium not included) which may contain neutron absorbers. These additional rods or bars will have dimensions equivalent to the UO_2 rods. By "number of rods per assembly", we mean the total number of fuel rods and replacement rods or bars.

All assemblies included in a load, bar one, can be replaced by dummy assemblies.
The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical State: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.96 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. MAINTAINING SUB-CRITICALITY

The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-1 DOS-12-00057682-501 Rev. 0.

Criticality-Safety Index (CSI): 0.625 (Number N=80)

APPENDIX 3

CONTENT No. 3

FRESH 14x14 PWR EIGHT-FOOT FUEL ASSEMBLIES

The contents should be loaded into an FCC 3 Version 2 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel assemblies

The authorized radioactive contents, as described in Chapter 1.3 - Ref. DOS-18-016471-006 version 1.0 of the Safety Analysis Report, comprise a maximum of two fresh fuel assemblies, designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	14x14
Nominal grid pitch (mm)	14.1
Length (foot)	8
Maximum total weight of assembly, with or without RCCA (kg)	448
Maximum UO_2 weight per assembly (kg)	346
Nominal active length (mm)	2,413
Maximum number of fuel rods	195 (1)
Characteristics of the fuel rods before irradiation:	
Cladding: - Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.57
- Minimum outer diameter (mm)	10.68
Pellets:	ENU (2)
- Maximum diameter (mm)	9.40
- Maximum oxide density (100% of theoretical density)	10.96
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234U/U}_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This number of rods corresponds to the maximum number of rods likely to be inserted into the structure (carcass or assembly framework), including into the guide tubes
(2) ENU: enriched natural uranium

Residue of glycerin (a maximum of 5 grams) may be present on each of the assemblies.

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All assemblies making up a load must adhere to the conditions defined in the table below.

Type of assembly	Maximum number of assemblies authorized for a load	Maximum initial enrichment level per rod ($^{235}U/U_{total}$) (%)	Minimum number of rods in each loaded assembly (1)
14x14	2	5	179
(1) Incomplete UO_2 fuel rod assemblies can be completed using gadolinium rods or rods containing depleted uranium or other metallic materials, or even by solid metallic rods (graphite & beryllium not included) which may contain neutron absorbers. These additional rods or bars will have dimensions equivalent to the UO_2 rods. By "number of rods per assembly", we mean the total number of fuel rods and replacement rods or bars.			

All assemblies included in a load, bar one, can be replaced by dummy assemblies.
The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical State: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.96 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. MAINTAINING SUB-CRITICALITY

The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-3 DOS-12-00057682-503 Rev. 0.

Criticality-Safety Index (CSI): 0 (Number N infinite)

APPENDIX 4

CONTENT No. 4

FRESH 14x14 PWR TEN-FOOT FUEL ASSEMBLIES

The contents should be loaded into an FCC 3 Version 2 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel assemblies

The authorized radioactive contents, as described in Chapter 1.3 - Ref. DOS-18-016471-006 version 1.0 of the Safety Analysis Report, comprise a maximum of two fresh fuel assemblies, designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	14x14
Nominal array pitch (mm)	14.1
Length (foot)	10
Maximum total weight of assembly with or without RCCA (kg)	557
Maximum UO_2 weight per assembly (kg)	437
Nominal active length (mm)	3,048
Maximum number of fuel rods	195 (1)
Characteristics of the fuel rods before irradiation:	
Cladding: - Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.57
- Minimum outer diameter (mm)	10.68
Pellets:	ENU (2)
- Maximum diameter (mm)	9.40
- Maximum oxide density (100% of theoretical density)	10.96
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This number of rods corresponds to the maximum number of rods likely to be inserted into the structure (carcass or assembly framework), including into the guide tubes.
(2) ENU enriched natural uranium

Residue of glycerin (a maximum of 5 grams) may be present on each of the assemblies.

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All assemblies making up a load must adhere to the conditions defined in the table below.

Type of assembly	Maximum number of assemblies authorized for a load	Maximum initial enrichment level per rod ($^{235}U/U_{total}$) (%)	Minimum number of rods in each loaded assembly (1)
14x14	2	5	179

(1) Incomplete UO_2 fuel rod assemblies can be completed by gadolinium rods; or rods containing depleted uranium or other metallic materials, or even by solid metallic rods (graphite & beryllium not included) which may contain neutron absorbers. These additional rods or bars will have dimensions equivalent to the UO_2 rods. By "number of rods per assembly", we mean the total number of fuel rods and replacement rods or bars.

All assemblies included in a load, bar one, can be replaced by dummy assemblies.
The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical state: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.96 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. MAINTAINING SUB-CRITICALITY

The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-3 DOS-12-00057682-503 Rev. 0.

Criticality-Safety Index (CSI): 0 (Number N infinite)

APPENDIX 5

CONTENT No.5

17x17 PWR TWELVE-FOOT FUEL RODS

The contents should be loaded into an FCC 3 Version 1 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel rods

The authorized radioactive contents, as described in Chapter 1.3 DOS-18-016471-006 version 1.0 of the Safety Analysis Report, comprise fresh fuel rods designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	17x17
Length (foot)	12
Maximum total mass per cavity (kg)	751
Maximum total mass of rods per box (kg)	461
Max mass of UO_2 (kg)	380/box (1) or 20/package (2)
Nominal active length (mm)	3,658
Maximum number of fuel rods per box	185
Cladding:	
- Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.52
- Minimum outer diameter (mm)	9.40
Pellets:	ENU (4)
- Maximum diameter (mm)	8.30
- Maximum oxide density (97.5 % of theoretical density)	10.69
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Minimum content, by mass, of $Gd2O_3$ in gadolinium fuel rods (%) (3)	2
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This maximum mass is only applicable to gadolinium contents and those using spacers.
(2) This maximum mass is only applicable to non-gadolinium contents and those using neither axial nor radial spacers.
(3) Rods with a Gd_2O_3 content of less than 2% are assumed equal to UO_2 rods (without gadolinium).
(4) ENU: enriched natural uranium

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All rods making up a load must adhere to the conditions defined in the table below.

Type of array	Maximum number of rods authorized per load, per box	Maximum initial enrichment level of each rod making up the load ($^{235}U/U_{total}$) (%)	Minimum number of rods in the load (1)
17x17	185 (2)	5	Full row of fuel rods or inert rods

(1) Incomplete rows of fuel rods may be topped up using solid stainless steel (or Zirconium alloy) bars with a nominal diameter of between 9.5 mm and 10 mm, possibly containing a neutron poison. The term "number of rods per box" means the total number of fuel rods and steel (or zirconium alloy) bars.
(2) When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 20 kg.

The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical state: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.69 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. INTERNAL FITTINGS

The internal fittings comprise a fuel rod box, as described in Chapters 1.3-1 & 1.3-2 DOS 12-00057684-031 & 032 Rev. 0.

2.1 Rod boxes

These non-assembled rods are grouped in FCC3 fuel rod channels, which are inserted in place of fuel assemblies in the FCC3 version 1.

The channel is made of a U-shaped plate closed at the ends and reinforced with two stringers welded on the upper part of the plate.

A radial and axial wedging system adapts to the length of the rods and ensures their positioning. A general arrangement drawing is given in Figure 5.1.

The minimum height of the radial support is 85 mm.

2.2 Spacers

A set of 2 spacers is used to provide longitudinal support to the box within the cavity (one spacer at the top, another at the bottom). The spacers are described in detail in Chapter 1.3-1 of DOS-12-00057684-031 Rev. 0.

3. MAINTAINING SUB-CRITICALITY

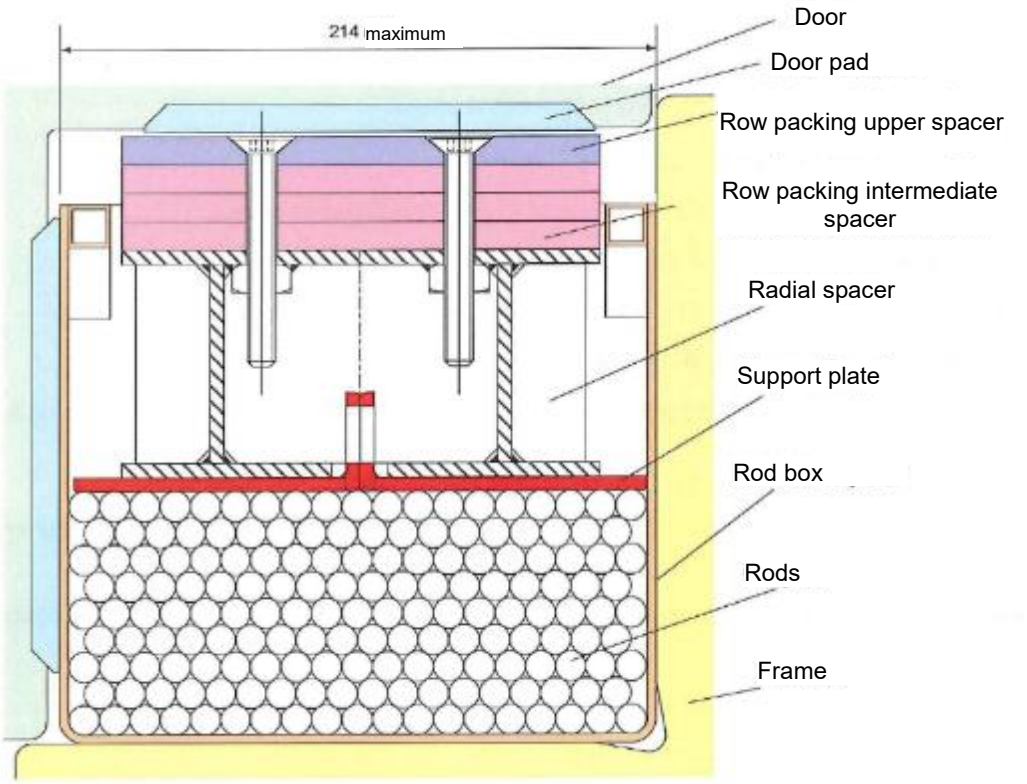
The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-2 DOS-12-00057682-502 Rev. 0 of the Safety Analysis Report.

When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 20 kg.

Criticality-Safety Index (CSI):

- When transporting UO_2 rods with radial and axial support, the criticality-safety index is equal to 0 (number N infinite),
- When transporting UO_2-Gd_2O_3 rods, with or without radial and axial support, criticality-safety index is equal to 0 (number N infinite),
- When transporting small quantities of UO_2 rods without radial or axial support, criticality-safety index is equal to 50 (Number N=1),

FIGURE 5.1
ROD BOX DIAGRAM



APPENDIX 6

CONTENTS No.6

15x15 PWR FUEL RODS

The contents should be loaded into an FCC 3 Version 1 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel rods

The authorized radioactive contents, as described in Chapter 1.3 DOS-18-016471-006 version 1.0 of the Safety Analysis Report, comprise fresh fuel rods designed for use in pressurized water reactors, as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	15x15
Maximum total mass per cavity (kg)	751
Maximum total mass of rods per box (kg)	470
Maximum mass of UO_2 (kg)	389/box (1) or 21.1/package (2)
Nominal active length (mm)	3,658
Maximum number of fuel rods per box	148
Cladding:	
- Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.57
- Minimum outer diameter (mm)	10.68
Pellets:	ENU (4)
- Maximum diameter (mm)	9.40
- Maximum oxide density (97.5 % of theoretical density)	10.69
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Minimum Gd_2O_3 content (by mass) of gadolinium rods (%) (3)	2
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This maximum mass is only applicable to gadolinium contents and those using spacers.
(2) This maximum mass is only applicable to non-gadolinium contents and those using neither axial nor radial spacers.
(3) Rods with a Gd_2O_3 content of less than 2% are assumed equal to UO_2 rods (without gadolinium).
(4) ENU: enriched natural uranium

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All rods making up a load must adhere to the conditions defined in the table below.

Type of array	Maximum number of rods authorized per load, per box	Maximum initial enrichment level of each rod making up the load ($^{235}U/U_{total}$) (%)	Minimum number of rods in the load (1)
15x15	148 (2)	5	Full row of fuel rods or inert rods

(1) Incomplete rows of fuel rods may be topped up using solid stainless steel (or Zirconium alloy) bars with a nominal diameter of between 10.7 mm and 11 mm, possibly containing a neutron poison. The term "number of rods per box" means the total number of fuel rods and steel (or zirconium alloy) bars.
(2) When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 21.1 kg.

The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical state: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidised, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.69 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. INTERNAL FITTINGS

The internal fittings comprise a fuel rod box, as described in Chapters 1.3-1 & 1.3-2 DOS 12-00057684-031 & 032 Rev. 0.

1.1 Fuel rod box

These non-assembled rods are grouped in FCC3 fuel rod channels, which are inserted in place of fuel assemblies in the FCC3 version 1.

The channel is made of a U-shaped plate closed at the ends and reinforced with two stringers welded on the upper part of the plate.

A radial and axial wedging system adapts to the length of the rods and ensures their positioning. A general arrangement drawing is given in Figure 6.1.

The minimum height of the radial support is 85 mm.

1.2 Spacers

A set of 2 spacers is used to provide longitudinal support to the box within the cavity (one spacer at the top, another at the bottom). The spacers are described in detail in Chapter 1.3-1 of DOS-12-00057684-031 Rev. 0.

3. MAINTAINING SUB-CRITICALITY

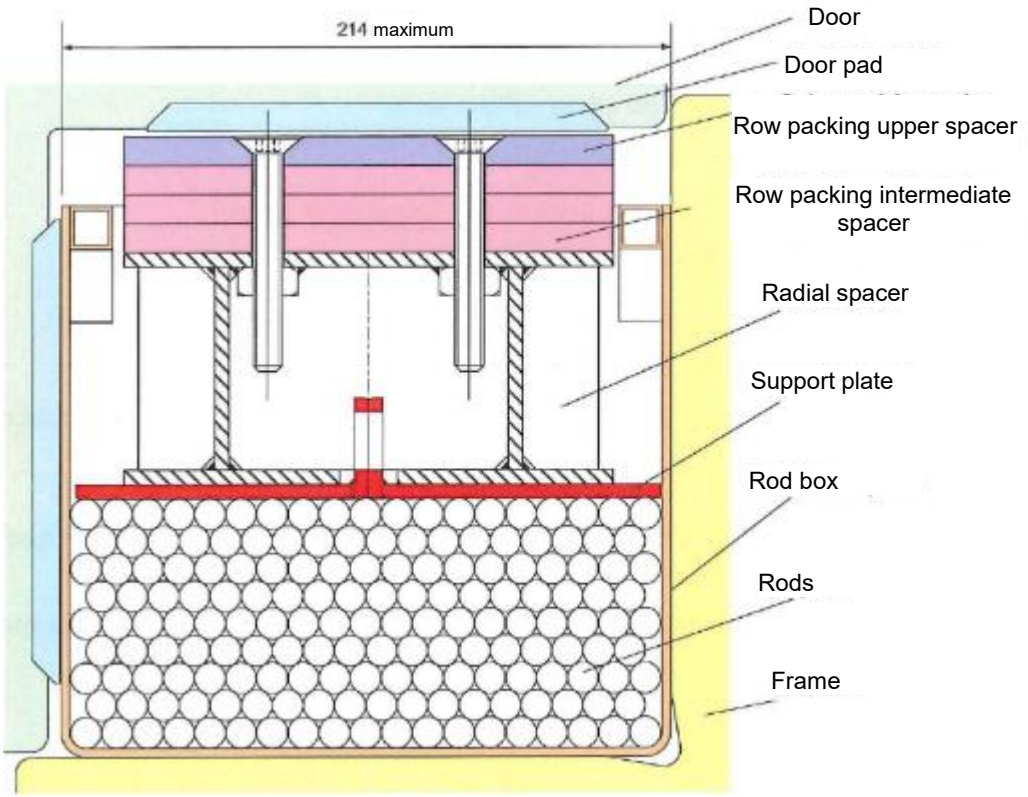
The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-2 DOS-12-00057682-502 Rev. 0.

When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 21.1 kg.

Criticality-Safety Index (CSI):

- When transporting UO_2 rods with radial and axial support, criticality-safety index is equal to 0 (number N infinite),
- When transporting UO_2-Gd_2O_3 rods with or without radial and axial support, criticality-safety index is equal to 0 (number N infinite),
- When transporting small quantities of UO_2 rods without radial or axial support, criticality-safety index is equal to 50 (number N=1),

FIGURE 6.1
ROD BOX DIAGRAM



APPENDIX 7

CONTENT No. 7

14x14 PWR EIGHT-FOOT FUEL RODS

The contents should be loaded into an FCC 3 Version 1 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel rods

The authorized radioactive contents, as described in Chapter 1.3 DOS-18-016471-006 version 1.0 of the Safety Analysis Report, comprise fresh fuel rods designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	14x14
Length (foot)	8
Maximum total mass per cavity (kg)	751
Maximum total mass of rods per box (kg)	433
Maximum mass of UO_2 (kg)	362/box (1) or 21.1/package (2)
Nominal active length (mm)	2,413
Maximum number of fuel rods per box	204
Cladding:	
- Material	Zirconium alloy, possibly pre-oxidised
- Minimum metal thickness (mm)	0.57
- Minimum outer diameter (mm)	10.68
Pellets:	ENU (4)
- Maximum diameter (mm)	9.40
- Maximum oxide density (97.5 % of theoretical density)	10.69
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio $^{232}U/U_{total}$ (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Minimum Gd_2O_3 content (by mass) of gadolinium rods (%) (3)	2
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This maximum mass is only applicable to gadolinium contents and those using spacers.
(2) This maximum mass is only applicable to non-gadolinium contents and those using neither axial nor radial spacers.
(3) Rods with a Gd_2O_3 content of less than 2% are assumed equal to UO_2 rods (without gadolinium).
(4) ENU: enriched natural uranium

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All rods making up a load must adhere to the conditions defined in the table below.

Type of array	Maximum number of rods authorised per load, per box	Maximum initial enrichment level of each rod making up the load ($^{235}U/U_{total}$) (%)	Minimum number of rods in the load (1)
14x14	204 (2)	5	Full row of fuel rods or inert rods

(1) Incomplete rows of fuel rods may be topped up using solid stainless steel (or Zirconium alloy) bars with a nominal diameter of between 10.7 mm and 11 mm, possibly containing a neutron poison. The term "number of rods per box" means the total number of fuel rods and steel (or zirconium alloy) bars.
(2) When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 21.1 kg.

The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical State: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.69 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. INTERNAL FITTINGS

The internal fittings comprise a fuel rod box, as described in Chapters 1.3-1 & 1.3-2 DOS 12-00057684-031 & 032 Rev. 0.

1.1 Fuel rod box

These non-assembled rods are grouped in FCC3 fuel rod channels, which are inserted in place of fuel assemblies in the FCC3 version 1.

The channel is made of a U-shaped plate closed at the ends and reinforced with two stringers welded on the upper part of the plate.

A radial and axial wedging system adapts to the length of the rods and ensures their positioning. A general arrangement drawing is given in Figure 7.1.

The minimum height of the radial support is 85 mm.

1.2 Spacers

A set of 2 spacers is used to provide longitudinal support to the box within the cavity (one spacer at the top, another at the bottom). The spacers are described in detail in Chapter 1.3-1 of DOS-12-00057684-031 Rev. 0.

3. MAINTAINING SUB-CRITICALITY

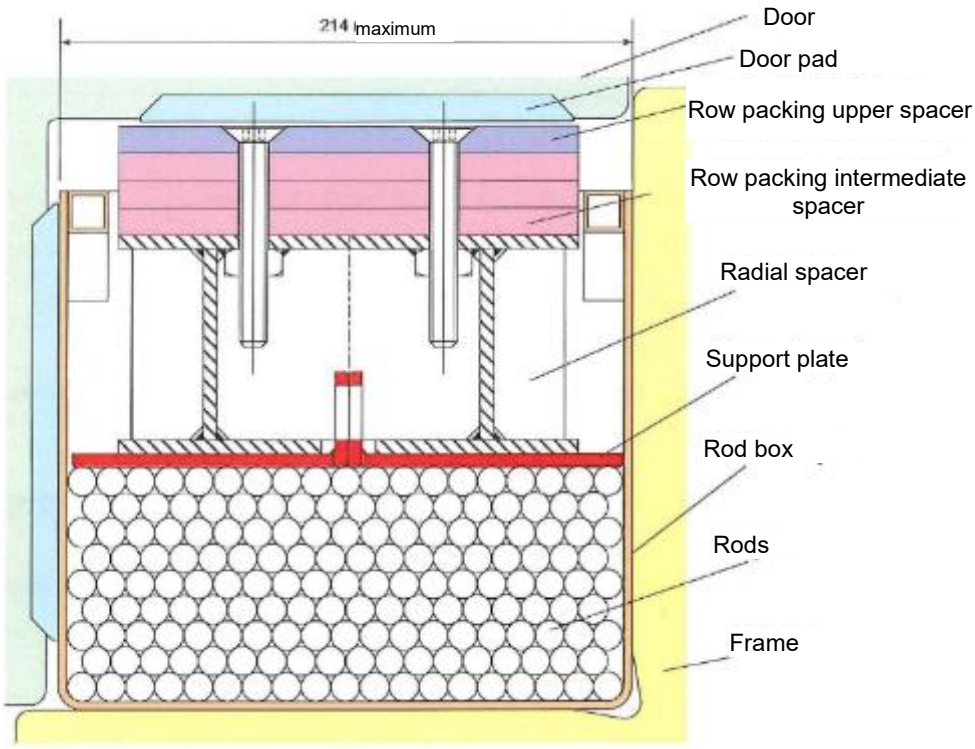
The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-2 DOS-12-00057682-502 Rev. 0.

When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 21.1 kg

Criticality-Safety Index (CSI):

- When transporting UO_2 rods with radial and axial support criticality-safety index is equal to 0 (number N infinite),
- When transporting UO_2-Gd_2O_3 rods with or without radial and axial support criticality-safety index is equal to 0 (number N infinite),
- When transporting small quantities of UO_2 rods without radial or axial support criticality-safety index is equal to 50 (number N=1),

FIGURE 7.1
ROD BOX DIAGRAM



APPENDIX 8

CONTENT NO. 8

14x14 PWR TEN-FOOT FUEL RODS

The contents should be loaded into an FCC 3 Version 1 packaging.

1. DEFINITION OF AUTHORIZED RADIOACTIVE CONTENTS

1.1 Characteristics of the fuel rods

The authorized radioactive contents, as described in Chapter 1.3 DOS-18-016471-006 version 1.0, of the Safety Analysis Report, comprise fresh fuel rods designed for use in pressurized water reactors (PWR), as detailed below:

Characteristics of the fuel rods before irradiation:	
Type of array	14x14
Length (foot)	10
Maximum total mass per cavity (kg)	751
Maximum total mass of rods per box (kg)	443
Maximum mass of UO_2 (kg)	374/box (1) or 21.1/package (2)
Nominal active length (mm)	3,048
Maximum number of fuel rods per box	167
Cladding:	
- Material	Zirconium alloy, possibly pre-oxidized
- Minimum metal thickness (mm)	0.57
- Minimum outer diameter (mm)	10.68
Pellets:	ENU (4)
- Maximum diameter (mm)	9.40
- Maximum oxide density (97.5 % of theoretical density)	10.69
- Maximum initial enrichment ($^{235}U/U_{total}$) (%)	5
- Maximum mass ratio ^{232}U/Utotal (%)	5.10^{-8}
- Maximum mass ratio $^{234}U/U_{total}$ (%)	0.055
- Maximum mass ratio $^{236}U/U_{total}$ (%)	0.05
Minimum Gd_2O_3 content (by mass) of gadolinium rods (%) (3)	2
Maximum absolute internal fuel rod pressure at 20°C (bar)	32.7

(1) This maximum mass is only applicable to gadolinium contents and those using spacers.
(2) This maximum mass is only applicable to non-gadolinium contents and those using neither axial nor radial spacers.
(3) Rods with a Gd_2O_3 content of less than 2% are assumed equal to UO_2 rods (without gadolinium).
(4) ENU: enriched natural uranium

The mechanical resistance properties of the materials used in the rod cladding must respect the following table:

$R_{p0.2}$ (MPa)	≥ 250
R_m (MPa)	≥ 400
A_t (% over 50 mm)	≥ 25

1.2 Loading conditions

All rods making up a load must adhere to the conditions defined in the table below.

Type of array	Maximum number of rods authorized per load, per box	Maximum initial enrichment level of each rod making up the load ($^{235}U/U_{total}$) (%)	Minimum number of rods in the load (1)
14x14	167 (2)	5	Full row of fuel rods or inert rods

(1) Incomplete rows of fuel rods may be topped up using solid stainless steel (or Zirconium alloy) bars with a nominal diameter of between 10.7 mm and 11 mm, possibly containing a neutron poison. The term "number of rods per box" means the total number of fuel rods and steel (or zirconium alloy) bars.
(2) When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 21.1 kg.

The presence of a desiccant is allowed.
The presence of materials with a greater hydrogen content than water as part of the packaging is not permitted.

Maximum activity level per packaging: The maximum activity of the content is less than 1 A_2.

Physical State: Fuel rod assemblies containing sintered pellets in a Zirconium alloy cladding, possibly pre-oxidized, meeting the criteria given in Paragraph 1.1 of the appendix.

Chemical composition: Uranium oxide pellets (UO_2) and/or fuel pellets made up a mixture of UO_2 at a ^{235}U enrichment level not exceeding 5% and a body acting as a neutron poison, with a mixture density of not more than 10.96 g/cm^3. The pellets may contain chrome oxides (but no other form of doping product).

Special form: The materials being shipped are not in special form.

2. INTERNAL FITTINGS

The internal fittings comprise a fuel rod box, as described in Chapters 1.3-1 & 1.3-2 DOS 12-00057684-031 & 032 Rev. 0.

2.1 Rod boxes

These non-assembled rods are grouped in FCC3 fuel rod channels, which are inserted in place of fuel assemblies in the FCC3 version 1.

The channel is made of a U-shaped plate closed at the ends and reinforced with two stringers welded on the upper part of the plate.

A radial and axial wedging system adapts to the length of the rods and ensures their positioning. A general arrangement drawing is given in Figure 8.1.

The minimum height of the radial support is 85 mm.

2.2 Spacers

A set of 2 spacers is used to provide longitudinal support to the box within the cavity (one spacer at the top, another at the bottom). The spacers are described in detail in Chapter 1.3-1 of DOS-12-00057684-031 Rev. 0.

3. MAINTAINING SUB-CRITICALITY

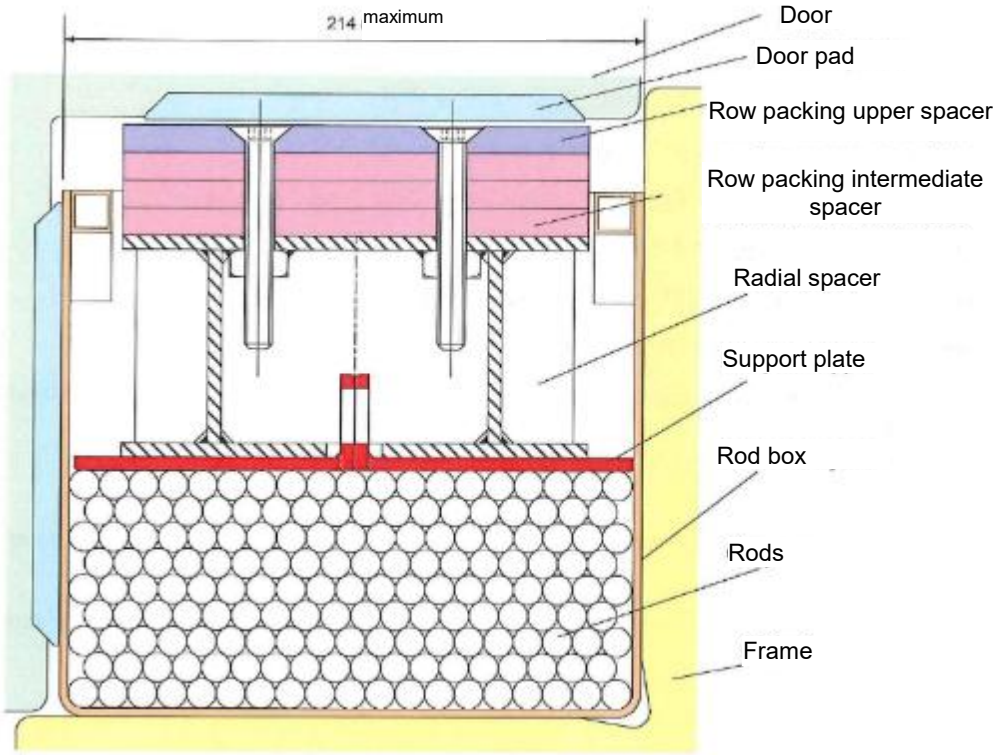
The demonstration of maintaining sub-criticality is the subject of Chapter 2.5-2 DOS-12-00057682-502 Rev. 0.

When transporting small quantities of UO_2 fuel rods without radial or axial supports, the maximum permissible mass of UO_2 per package is 21.1 kg.

Criticality-Safety Index (CSI):

- When transporting UO_2 rods with radial and axial support criticality-safety index is equal to 0 (number N infinite),
- When transporting UO_2-Gd_2O_3 rods with or without radial and axial support criticality-safety index is equal to 0 (number N infinite),
- When transporting small quantities of UO_2 rods without radial or axial support criticality-safety index is equal to 50 (number N=1),

FIGURE 8.1
ROD BOX DIAGRAM



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/0776/AF-96

ORIGINAL REGISTRANT(S):

TN Americas LLC
Orano TN
7160 Riverwood Drive
Suite 200
Columbia, MD, 21046
USA

Framatome Inc.
2101 Horn Rapids Road
Richland, WA, 99354
USA

Orano Nuclear Packages and Services
Établissement Saint-Quentin-en-Yvelines
1, rue des Hérons
78180 Montigny-le-Bretonneux
France

Framatome (France)
54 Avenue de la Déportation
26100 Romans-sur-Isère
France