



DIRECTION DU TRANSPORT ET DES SOURCES

**CERTIFICATE OF APPROVAL
OF A PACKAGE MODEL****F/381/AF- 96 (Di)
page 1/2**

The French competent authority,

Given the application submitted by the TN International company in the letter CEX-15-00115358-121 dated December 14th, 2015,

Given the TN International Safety Analysis Report DOS-06-00037028-000 Rev. 7 of July 21st, 2016,

certifies that the package design called "TNF-XI", as described in appendix 0 index i and:

- loaded with oxides of uranium, unirradiated, enriched to a maximum of 5 % in ²³⁵U as described in appendix 2i, (content n°2) ;
- loaded with oxides of uranium, unirradiated, enriched to a maximum of 5 % in ²³⁵U as described in appendix 7i, (content n°7) ;

complies, as a Type A package containing fissile materials,

with the requirements of the regulations, agreements or recommendations listed below:

- Safety Standards Series– Regulations for the Safe Transport of Radioactive Materials – International Atomic Energy Agency n° SSR-6, 2012 Edition ;
- European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) ;
- Regulations concerning the International carriage of Dangerous goods by Rail (RID) ;
- European Agreement concerning the International Carriage of Dangerous goods by inland waterways (ADN) ;
- International Maritime Dangerous Goods Code (IMDG Code from IMO) ;
- Order of May 29th, 2009 concerning the carriage of dangerous goods by terrestrial ways (TMD Order) ;
- Order of November 23th, 1987 modified concerning the Ship Safety, section 411, attached (RSN Order).

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.

This certificate expires on **31/12/2021**.

Registration number: **CODEP-DTS-2016-033417**

Montrouge, **6th September 2016**

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SUMMARY OF CERTIFICATE ISSUES

| Issue | Expiration | Type of issue and modifications | Authority | Type of certificate | Revision index | | | | | | | | | |
|------------|------------|--|-----------|---------------------|----------------|---|---|---|---|---|---|---|---|---|
| | | | | | | t | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 05.08.2002 | 05.08.2007 | First issue type A and type IP-2 package | DGSNR | AF-96 | Aa | - | a | a | a | a | a | - | - | - |
| 31.10.2002 | 05.08.2007 | Extension type A and type IP-2 package | DGSNR | AF-96 | Ab | - | b | b | b | b | b | - | - | - |
| 04.07.2007 | 31.12.2011 | Prorogation type A package | ASN | AF-96 | Bc | - | c | c | c | - | - | - | - | - |
| 04.07.2007 | 31.12.2011 | Prorogation type IP-2 package | ASN | IF-96 | Bd | - | d | - | - | d | d | - | - | - |
| 25.11.2010 | 31.12.2011 | Extension type A package | ASN | AF-96 | Be | - | e | - | - | - | - | e | - | - |
| 10.10.2011 | 31.12.2016 | Prorogation type A package | ASN | AF-96 | Cf | - | f | f | f | - | - | - | - | - |
| 10.10.2011 | 31.12.2016 | Prorogation type IP-2 package | ASN | IF-96 | Cg | - | g | - | - | g | g | - | - | - |
| 11.08.2014 | 31.12.2016 | Extension type A package | ASN | AF-96 | Ch | - | h | - | - | - | - | - | h | - |
| 06.09.2016 | 31.12.2021 | Prorogation and extension type A package | ASN | AF-96 | Di | - | i | - | i | - | - | - | - | i |

APPENDIX 0

TNF-XI PACKAGING

1. DESCRIPTION OF THE PACKAGING

The packaging is designed, manufactured, inspected, tested, maintained and used in compliance with the Safety Analysis Report TN International DOS-06-00037028-000 Rev. 7 of July 21st, 2016.

The TNF-XI packaging, of a generally rectangular shape, is presented in Figure 0.1.

The design drawing of the packaging is the drawing COGEMA LOGISTICS 12986-01 Rev. K.

The outer overall dimensions of the packaging are:

- Nominal height of body: 940 mm,
- Maximal nominal height of packaging: 1040 mm,
- Cross section of body: 1100 × 1100 mm (overall nominal dimensions).

The maximal weight of empty packaging (± 10 kg) is 660 kg.

The maximal weight of loaded packaging allowable in transport is 1050 kg.

The packaging comprises the main components described below.

1.1 Body

The body of the packaging consists of a steel external casing of rectangular shape, and four cylindrical internal wells, also made of steel, separated by a layer of shock-absorbing and thermally insulating material.

Each well consists of two steel shells separated by a filling of neutron shielding material. The natural boron concentration of this material is compliant with the value specified in chapter 0 of Safety Analysis Report.

1.2 Closing device

Each well is closed by a primary lid equipped with an elastomer gasket. The internal face is equipped with four steel teeth enabling the closing on the well flange by a "bayonet system".

The primary lid is protected by an upper plug formed by the superimposing of discs. This assembly is surrounded by a thin steel covering. The upper face comprises six steel teeth enabling closing on the body flange by a "bayonet system". Leaktightness between the plug and the body is provided by a seal.

1.3 Handling and storage components

The lower face of the packaging is equipped with steel forklift paths.

1.4 Safety functions

The main safety functions and the most important elements for safety are:

- **the containment** provided by the containment system constituted of:
 - the four stainless steel cylindrical inner wells;
 - the four flat stainless steel bottoms welded to the cylindrical inner wells;
 - the four primary lids and their seals;

- **the radiological shielding** mainly provided by:
 - the resin contained between the cylindrical inner and outer wells;
 - the foam in the packaging body;
 - the steel sheets contained especially in the primary lids, the outer shells, the four cylindrical inner and outer wells;
 - the borated steel sheets;
 - the discs near the upper plugs;
- **the safety criticality** provided by the confinement system constituted of the elements described in chapter 0 of the safety analysis report ;
- **the protection against shock** is mainly provided by the shock absorber material contained in the body of the packaging ;
- **the protection against fire** mainly provided by insulating material.

2. MEASURES TO BE TAKEN BY CONSIGNOR BEFORE SHIPMENT

The package must be used in compliance with the operating instructions described in chapter DOS-06-00037028-600 Rev. 4 (Chapter 6A) of the Safety Analysis Report.

The correct closing of the pails used for the packaging of the contents must be subject to a visual inspection before loading in the cavity of the package.

3. MAINTENANCE PROGRAM

The maintenance program of the packaging is described in chapter DOS-06-00037028-700 Rev. 0 (Chapter 7A) of the Safety Analysis Report.

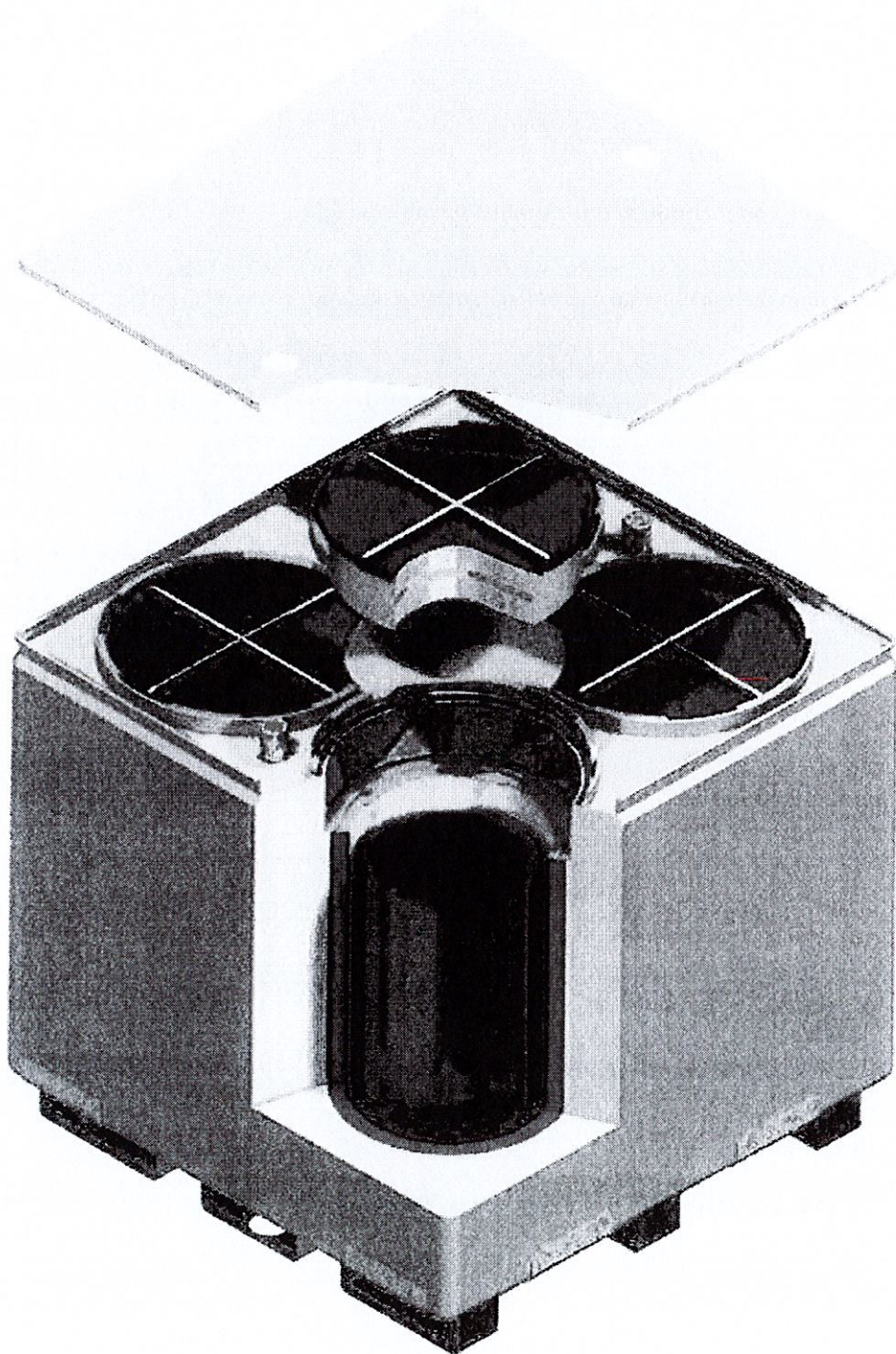
4. NOTIFICATION AND REGISTRATION OF SERIAL NUMBERS

Should a packaging be disposed of or change ownership, this must be notified to the competent authorities. Accordingly, the party relinquishing ownership of a packaging shall forward the name of the new owner.

5. QUALITY ASSURANCE

The applicable quality assurance principles for the packaging design, manufacture, inspection, tests, maintenance and use must be compliant with these described in chapter DOS-06-00037028-800 Rev. 1 (Chapter 8A) of the Safety Analysis Report.

FIGURE 0.1
SKETCH OF THE TNF-XI PACKAGE



APPENDIX 2

CONTENTS N° 2: URANIUM OXIDES (UO₂, UO₃, OR U₃O₈)

1. AUTHORIZED CONTENT DEFINITION

1.1 Physical form

The radioactive content is constituted of uranium oxides (UO₂, UO₃, or U₃O₈) in the form of powder, pellets or scraps of pellets.

1.2 Isotopic composition and maximal allowable weight

The maximal allowable weight of uranium oxide in each cavity (shared out in three pails) of the package is limited to the values defined in function of the maximum content enrichment in ²³⁵U, as follows:

| Mass enrichment ($e = {}^{235}\text{U}/\text{U}_{\text{tot}}$) | UO ₂ , UO ₃ , U ₃ O ₈ (powder, pellets or scraps of pellets) |
|---|---|
| ≤ 4.15% | 75.0 kg |
| ≤ 4.45% | 64.5 kg |
| ≤ 4.65% | 58.5 kg |
| ≤ 4.85% | 53.5 kg |
| ≤ 4.95% | 51.5 kg |
| ≤ 5% | 50.0 kg |
| Density | ≤ 10.96 g/cm ³ |

The powder of uranium oxide may contain impurities. The Aluminium and Carbon impurities shall not exceed the limit specified hereafter:

| Elements | Maximum concentration (ppm) |
|----------|--------------------------------|
| Al | ≤ 5,000 |
| C | ≤ 10,000 |

1.3 Maximal activity

The radioactive contents must comply with the “unirradiated Uranium” definition of the applicable regulation.

1.4 Maximal weight of powder

The total maximal weight of this content is 300 kg.

2. PACKAGING

Inner primary containers: pails

The uranium oxide may be placed in bags constituted of material more hydrogenated than water. Packed (or not) uranium oxide is placed in pails (three for each cavity) in stainless steel compliant with the following characteristics:

- Placed in vertical position,
- Material : stainless steel,
- Nominal diameter: 287.4 mm,
- Lid in stainless steel with closure ring,
- Empty weight: approximately 7 kg,
- The thickness of the pails is at least equal to 1 mm,
- Presence of a borated steel ring in the pails that must comply with the following characteristics: minimal height: 180 mm, minimal thickness: 2 mm, external diameter between 280 mm and 285 mm, natural boron mass content: greater than 1%, which represents a concentration in ^{10}B of $C \geq 8.7 \cdot 10^{20}$ at/cm³. The borated ring may have a longitudinal weld.

Each cavity must always contain the three pails stacked in vertical position with their borated steel ring.

The maximal authorised mass of plastic material more hydrogenated than water is limited to 390 g per cavity. The operating temperature of the plastic bag must be equal or greater than 100°C.

3. CRITICALITY ANALYSIS

It is subject of chapters DOS-06-00037028-500 Rev.5 (chapter 5A), DOS-06-00037028-503 Rev.0 (chapter 5A-3) and DOS-06-00037028-504 Rev.0 (chapter 5A-4) of the Safety Analysis Report.

Confinement system considered is described in the chapter DOS-06-00037028-500 Rev.5 (chapter 5A) of the Safety Analysis Report.

Criticality Safety Index (CSI): 0.

APPENDIX 7

CONTENTS N° 7: URANIUM OXIDES (UO₂, UO₃, OR U₃O₈)

1. AUTHORIZED CONTENTS DEFINITION

1.1 Physical form

The radioactive content is constituted of uranium oxides (UO₂, UO₃, or U₃O₈) in the form of powder or scraps of pellets mixed with residues consisting in incinerator ashes or earth, sand and residues from dissolution.

1.2 Isotopic composition and maximal allowable weight

The maximal allowable weight of uranium in each cavity (shared out in three pails) of the package is limited to 5 kg of uranium under form of uranium oxides. The maximum mass enrichment "e" in ²³⁵U is limited to 5% ($e = \frac{^{235}\text{U}}{U_{\text{tot}}}$).

The residues incinerator ashes consist of mainly silica, alumina, aluminosilicates, metal oxides, phosphates, aluminium metal, charred wood and charred plastic in undefined part.

The earth, sand and dissolved residues consist of mainly silica, alumina, titania, iron oxide and aluminosilicate in undefined part. Other organic or inorganic compounds may be present in the form of traces.

The residues are chemically stable, contain no liquid.

The authorised quantity of uranium oxides and residues is limited to 75 kg per cavity.

1.4 Maximal activity

The radioactive contents must comply with the "unirradiated Uranium" definition of the applicable regulation.

1.5 Maximal weight of powder

The total maximal weight of this content is 300 kg.

2. PACKAGING

Inner primary containers: pails

The uranium oxide can be placed in bags constituted of material more hydrogenated than water. Packed (or not) uranium oxide is placed in pails (three for each cavity) in stainless steel compliant with the following characteristics:

- Placed in vertical position,
- Material : stainless steel,
- Nominal diameter: 287.4 mm,
- Lid in stainless steel with closure ring,
- Empty weight: approximately 7 kg,
- Presence of a steel ring (that can be borated) in the pails that must comply with the following characteristics: minimal height: 180 mm, minimal thickness: 2 mm, external diameter between 280 mm and 285 mm. The borated ring may have a longitudinal weld.

Each cavity must always contain the three pails stacked in vertical position with their steel ring.

The operating temperature of the plastic bag must be equal or greater than 100°C.

3. CRITICALITY ANALYSIS

It is subject of chapters DOS-06-00037028-500 Rev.5 (chapter 5A) and DOS-06-00037028-505 Rev.0 (chapter 5A-5) of the Safety Analysis Report.

Confinement system considered is described in the chapter DOS-06-00037028-500 Rev.5 (chapter 5A) of the Safety Analysis Report.

Criticality Safety Index (CSI): 0.

