



## 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 International Nuclear Services Limited (see Section 5)

as: Type AF

by: road, rail and sea.

Packaging identification: Uranic Materials Container Type 3516

Packages manufactured to this design meet the requirements of the regulations and codes on page 2, 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 is valid until the end of May 2024 (see Section 5).

COMPETENT AUTHORITY IDENTIFICATION MARK: GB/3516C/AF-96

Signature:

Date of Issue: 17 May 2019

Gavin Smith, Superintending Inspector  
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 2012 Edition

#### United Nations Economic Commission for Europe (UNECE)

European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2017 Edition (until end of June 2019) or European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2019 Edition

#### Intergovernmental Organisation for International Carriage by Rail (OTIF)

Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2017 Edition (until end of June 2019) or Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2019 Edition

#### International Maritime Organization (IMO)

International Maritime Dangerous Goods (IMDG) Code 2016 Edition incorporating Amendment 38-16 (until end of December 2019) or International Maritime Dangerous Goods (IMDG) Code 2018 Edition incorporating Amendment 39-18

#### International Civil Aviation Organization (ICAO)

Technical Instructions for the Safe Transport of Dangerous Goods by Air 2019-2020 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 Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations 2011 (SI 2011 No. 1885); 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; The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations (Northern Ireland) 2011, No 365

#### **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 Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations 2011 (SI 2011 No. 1885); 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 1893 (M) The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form: Amendment 39-18 to the International Maritime Dangerous Goods (IMDG) Code

#### **AIR**

The Air Navigation Order 2016 (SI 2016 No. 765); The Air Navigation (Dangerous Goods) Regulations 2002 (SI 2002 No.2786); The Air Navigation (Dangerous Goods) (Amendment) Regulations 2017 (SI 2017 No.28); Exemption to Enable Use of the 2019-2020 Edition of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (ORS4 No. 1291)

## 1. DESIGN SPECIFICATION

### Package Design

- 1.1 The package design specification shall be in accordance with Westinghouse Transport Report No. 186 Issue 4 "Design Safety Report in Support of Competent Authority Approval for Fuel Transport Container Package Design No. 3516A & 3516C Type AF & Type IF" dated 14 May 2019, and modifications to the package design approved by the authorities named on page 1 of this certificate under the established modifications procedure.

### Design Drawings

- 1.2 The design is specified in the following drawings.

| Design No. | Title (number of components)                               | Drawing / Drawing List | Issue |
|------------|--|------------------------|-------|
| 3516       | General Arrangement Fuel Transport Container Type 3516 (1) | PK330525               | H     |
| 3544       | Pail Assembly Fuel Transport Container Type 3544 (9)       | PK324038               | H     |
| GB/3516    | Drawing List for Package Type GB/3516                      | DRG/3516               | 14    |
| GB/3516    | Document List for Package Type GB/3516                     | DOC/3516               | 11    |

### Package Description and Materials of Manufacture

- 1.3 The package is cuboidal in shape. It has an outer container made of stainless steel, with a removable lid at the top secured by twelve bolts. Inside there is a 100mm thick layer of thermal insulation on the base, sides and underside of lid which serves the dual purpose of providing thermal protection and holding a stainless steel inner liner centrally in place within the outer container. The inner liner is provided with a removable lid secured by sixteen bolts. Neutron absorbing boronated resin is cast inside the inner liner to a depth of 450mm, with nine cylindrical positions provided in the resin interspersed with expanded polystyrene plugs. The nine positions house the stainless steel pails with each having a removable lid, secured by a clamp band. The radioactive material is contained within the pails. See Appendix 1 for package illustration.

### Package Dimension and Weights

- 1.4 Nominal dimensions: 1062mm square plan x 908mm high
- 1.5 Maximum authorised gross weight: 693kg

### Authorised Contents

- 1.6 The authorised radioactive content is:
- Solid uranium compounds in the form of uranium oxide powder.
  - The maximum payload mass of uranium oxide per pail / package will depend on enrichment as described in paragraph 1.10 below.

### Restriction on Contents

- 1.7 The restrictions on content are:
- The total activity of the contents shall not exceed one  $A_2$ .
  - The mass of the contents shall be such that the gross mass of the package is greater than 500kg.

## Containment System

1.8 The containment system comprises three parts:

- a) The primary containment is the pail, which is designed to hold the package contents within polyethylene bags.
- b) The inner liner is designed to retain the pails.
- c) The outer body of the 3516 container is designed to retain the inner liner.

## Fissile Material Restrictions

1.9 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.

### *Fissile material approval C1*

1.10 Fissile material:

Uranium oxide powder enriched up to 5.0wt% U-235/U(total). The maximum payload mass per pail / package is limited according to enrichment:

| Enrichment Band<br>(wt% U-235/U(total)) | Maximum Payload Mass (kg) |             |
|---|---------------------------|-------------|
|   | per pail                  | per package |
| up to 5.0                               | 24.0                      | 216.0       |
| up to 4.9                               | 25.0                      | 225.0       |
| up to 4.8                               | 26.0                      | 234.0       |
| up to 4.7                               | 27.0                      | 243.0       |

1.11 Conditions:

- a) The mixing of enrichment bands within the package shall not occur.
- b) Substances with a hydrogen density greater than water shall not be carried; however, up to 256g of polyethylene may be used for wrapping or packing within each pail.
- c) The mass of moisture associated with the uranium oxide powder is included in the maximum mass loadings stated above and shall not exceed 0.4wt%.
- d) The bulk density of the uranium oxide powder shall not exceed 3.1g/cm<sup>3</sup>.
- e) Uranium carbides, hydrides, nitrides and metallic uranium shall not be carried.
- f) Beryllium, graphite, carbon granules and substances enriched in deuterium shall not be carried.

1.12 The confinement system comprises the following:

- a) The nine stainless steel pails.
- b) The inner liner comprising NS-4-FR neutron shielding material with a density of at least 1.58g/cm<sup>3</sup>, a boron carbide (B<sub>4</sub>C) content of at least 1.444wt% and a hydrogen content of at least 4.93wt%.
- c) The outer shell with calcium silicate insulation insert.

1.13 Criticality Safety Index (CSI) = 1.66

1.14 The criticality safety documentation comprises Sellafeld Ltd Report 3516C/CR01 Issue 01, dated 7 April 2017; Sellafeld Ltd Criticality Design Safety Memorandum CDSA/DESM/0817/2303, (3516C/CR01/M01) dated 17 August 2017 and Sellafeld Ltd Criticality Design Safety Memorandum CDSA/DESM/0917/2312, (3516C/CR01/M02) dated 25 September 2017.

1.15 This package design has been shown to be sub-critical following water ingress as required by paragraphs 680 and 681 of IAEA SSR-6. Special features to exclude water are not therefore required.

- 1.16 The fissile material is unirradiated (this does not preclude the use of reprocessed material).
- 1.17 Ambient temperature range for package design:
- a) -40°C to +38°C
- 1.18 Air transport restrictions:
- a) The package has not been shown to be subcritical under the conditions specified in paragraph 683 of IAEA SSR-6. The package shall not, therefore, be transported by air.
- 1.19 Any fissile materials not specified in paragraph 1.10 are permitted to be present in only trace quantities, that is to say up to either a total of 1g per package, or a concentration of 0.1% by mass of the total fissile nuclides present.

## **2. USE OF PACKAGE**

### **Information Provided in Safety Report on Use of Packaging**

- 2.1 The packaging shall be used and handled in accordance with Sections 4.1 and 7.4 of the design safety report referred to in paragraph 1.1 above.
- 2.2 The packaging shall be maintained in accordance with Sections 7.3 and 7.4 of the design safety report referred to in paragraph 1.1 above.

### **Actions Prior to Shipment**

- 2.3 Administrative and engineered 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 instructions on the use of the packaging.

### **Emergency Arrangements**

- 2.4 Before shipment takes place, suitable emergency plans will have been drawn up, copies of which shall be supplied to the GB Competent Authority on demand.
- 2.5 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 and requested to call NAIR (National Arrangements for Incidents involving Radioactivity).

## **3. MANAGEMENT SYSTEMS**

- 3.1 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 the letter from International Nuclear Services Limited (Ref: 19053516.01) dated 14 May 2019 and comprise the following:
- Principal Consignor:
    - Westinghouse UK Transport, Springfield Site System Manual - SSI 268 Issue 7 dated October 2018
  - Design Authority:
    - Package Design Group, Springfield Site System Manual - SSI 268 Issue 7 dated October 2018
  - Applicant:
    - International Nuclear Services and Pacific Nuclear Transport Limited – Management Systems Manual – INS PNTL MSM PROM 000 - M01, Issue 7 dated May 2018

- 3.2 No alteration may be made to any management system confirmed as adequate in relation to this design, unless:
- a) the authorities named on page 1 of this certificate have confirmed the amended management system is adequate prior to implementation or use; or
  - b) the alteration falls within the agreed change control procedures set out in the management system(s).
- 3.3 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.

#### 4. ADMINISTRATIVE INFORMATION

##### Related Approvals

- 4.1 Other related GB certificates using the GB/3516 outer package are:

| Certificate            | Date of Issue    | Date of Expiry   |
|------------------------|------------------|------------------|
| GB/3516A/AF-96 (Rev.4) | 17 May 2019      | 31 May 2024      |
| GB/3516A/IF-96 (Rev.2) | 17 May 2019      | 31 May 2024      |
| GB/3516B/AF-96 (Rev.0) | 13 December 2016 | 31 December 2021 |
| GB/3516C/IF-96 (Rev.0) | 17 May 2019      | 31 May 2024      |

This list was complete at the time of compilation of this design approval certificate. Other related certificates may exist.

##### Shipment Approval

- 4.2 Not applicable

##### Packaging Serial Numbers

- 4.3 For the purpose of compliance with ADR / RID / IMDG, the owner of the packaging shall be responsible for informing ONR of the serial number of each packaging manufactured to this design.

##### Additional Technical Data / Information

- 4.4 Not applicable

5. CERTIFICATE STATUS

Design approval issued to:

International Nuclear Services Limited  
Hinton House, Risley  
Warrington, Cheshire  
WA3 6GR  
United Kingdom

| Issue / Revision Number | Date of Issue | Date of Expiry | Reason for Revision |
|-------------------------|---------------|----------------|---------------------|
| 0                       | 17 May 2019   | 31 May 2024    | First approval      |

## APPENDIX 1 – PACKAGE ILLUSTRATION

