



U.S. Department  
of Transportation

Pipeline and  
Hazardous Materials  
Safety Administration

COMPETENT AUTHORITY CERTIFICATION  
FOR A TYPE B(U)F FISSILE  
RADIOACTIVE MATERIALS PACKAGE DESIGN  
CERTIFICATE USA/0752/B(U)F-96, REVISION 0

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

REVALIDATION OF UNITED KINGDOM COMPETENT AUTHORITY  
CERTIFICATE GB/2816H/B(U)F-96

This certifies that the radioactive material package design described is hereby approved for use within the United States for import and export shipments only. Shipments must be made in accordance with the applicable regulations of the International Atomic Energy Agency<sup>1</sup> and the United States of America<sup>2</sup>.

1. Package Identification - SAFEKEG 2816H.
2. Package Description and Authorized Radioactive Contents - as described in United Kingdom Certificate of Competent Authority GB/2816H/B(U)F-96, Issue 2 (attached). United Kingdom Change No. CN-031, Issue B is authorized for use (attached).
3. Criticality - The minimum criticality safety index is 0.0. The maximum number of packages per conveyance is determined in accordance with Table X 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 Hazardous Materials Technology, (PHH-23), Pipeline and Hazardous 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.

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<sup>1</sup> "Regulations for the Safe Transport of Radioactive Material, 1996 Edition (Revised), No. TS-R-1 (ST-1, Revised)," published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

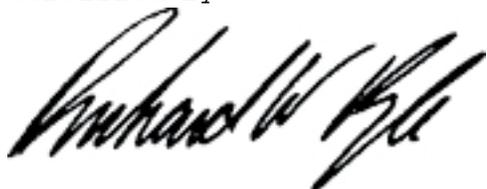
<sup>2</sup> Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

**CERTIFICATE USA/0752/B(U)F-96, REVISION 0**

- d. Records of Quality Assurance activities required by Paragraph 310 of the IAEA regulations<sup>1</sup> 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. Marking and Labeling - The package shall bear the marking USA/0752/B(U)F-96 in addition to other required markings and labeling.
6. Expiration Date - This certificate expires on December 31, 2007.

This certificate is issued in accordance with paragraph 814 of the IAEA Regulations and Section 173.472 and 173.473 of Title 49 of the Code of Federal Regulations, in response to the October 22, 2007 petition by Croft, Inc., Los Alamos, NM, and in consideration of other information on file in this Office.

Certified By:



Robert A. Richard  
Deputy Associate Administrator for Hazardous Materials Safety

**Oct 29 2007**  
(DATE)

Revision 0 - Issued to endorse United Kingdom Certificate of Approval No. GB/2816H/B(U)F-96, Issue 2 and United Kingdom Change Number CN-031, Issue B for a period of 60 days.



# Certificate of Approval of Package Design for the Carriage of Radioactive Materials

**THIS IS TO CERTIFY** that the Secretary of State for Transport being, for the purposes of the Regulations of the International Atomic Energy Agency, the Competent Authority of Great Britain in respect of inland surface transport and of the United Kingdom of Great Britain and Northern Ireland in respect of sea and air transport and the Department of the Environment for Northern Ireland being the Competent Authority of Northern Ireland in respect of inland surface transport, have approved the package design as specified in section 1 of this certificate, as applied for by Croft Associates Ltd (see section 6)

as Type B(U)F (see paragraph 4.2)

by all modes

**Packaging Identification: SAFKEG 2816H**

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 quality assurance programme(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 supersedes all previous issues and is valid until the end of **October 2012 (see section 6)**

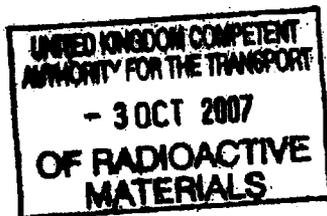
### COMPETENT AUTHORITY IDENTIFICATION MARK:

Type B(U) Fissile  
(see section 4.3)

GB/2816H/B(U)F-96

Type B(U) Fissile Excepted or Non-fissile  
(see section 4.3)

GB/2816H/B(U)-96



Transport Radiological Adviser  
Department for Transport  
Great Minster House  
76 Marsham Street  
London SW1P 4DR

On behalf of the Secretary of State for Transport,  
and the Department of the Environment for 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 AND CODES OF PRACTICE GOVERNING THE TRANSPORT OF RADIOACTIVE MATERIALS

**INTERNATIONAL**

International Atomic Energy Agency (IAEA)

TS-R-1 Regulations for the Safe Transport of Radioactive Materials 2005 Edition.

International Maritime Organisation (IMO)

International Maritime Dangerous Goods (IMDG) Code Amendment 32-04 (until 31 December 2007) or Amendment 33-06.

International Civil Aviation Organisation (ICAO)

Technical Instructions for the Safe Transport of Dangerous Goods by Air 2007-2008 Edition.

United Nations Economic Commission for Europe (UNECE)

European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2007 Edition.

Intergovernmental Organisation for International Carriage by Rail (OTIF)

Convention concerning International Carriage by Rail (COTIF) Appendix B. Uniform Rules concerning the Contract for International Carriage of Goods by Rail (CIM) Annex 1 Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2007 Edition.

**UNITED KINGDOM**

**ROAD**

GREAT BRITAIN ONLY.

The Radioactive Material (Road Transport) (Definition of Radioactive Material) Order 2002, SI 2002 No. 1092.

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007, SI 2007 No 1573.

**NORTHERN IRELAND ONLY.**

The Radioactive Substances (Carriage by Road) Regulations (Northern Ireland) 1983, SR 1983 No 344. The Radioactive Substances (Carriage by Road) (Amendment) Regulations (Northern Ireland) 1986, SR 1986 No 61.

**RAIL**

GREAT BRITAIN ONLY.

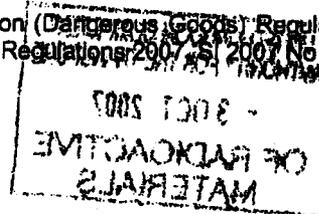
The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007, SI 2007 No 1573.

**SEA**

British registered ships. All other ships whilst in United Kingdom territorial waters. The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997, SI 1997 No 2367; Merchant Shipping Notice No MSN 1806 M, "The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form - Amendment 33-06 to the International Maritime Dangerous Goods (IMDG) Code".

**AIR**

The Air Navigation Order 2005, SI 2005 No 1970. The Air Navigation (Dangerous Goods) Regulations 2002, SI 2002 No 2786. The Air Navigation (Dangerous Goods) (Amendment) Regulations 2007, SI 2007 No 28.



**1. PACKAGE DESIGN SPECIFICATION**

The Package Design Specification shall be in accordance with Croft Associates Ltd Safety Report reference DSR 2816H-96 Issue D dated 13 September 2007, and modifications to the package design approved by the authority named on page 1 of this certificate under the established modifications procedure.

**1.1 Specification of Design**

Design No.	Title (number of components)	Drawing/Drawing List	Issue
2816	Outer / keg (one)	) DL-OC-5651	B
2851	Inner / Containment Vessel (one)		

**1.2 Authorised Contents**

- a) Unirradiated solid material including isotopes of Plutonium, Uranium, Thorium and Americium within a primary containment as specified in PCS031 Issue D.
- b) The package may be transported empty of contents.
- c) The total rate of heat generation shall not exceed 80 W
- d) The total activity of the isotopic content shall not exceed:
  - Pu 238 – 89.8 TBq
  - Pu 239 – 2.31 TBq
  - Pu 240 – 8.45 TBq
  - Pu 241 – 731 TBq
  - Pu 242 – 0.146 TBq
  - Am 241 – 36.2 TBq
  - Th 232 – 4.07 MBq
  - U 233 – 0.155 TBq
  - U234 – 0.232 TBq
  - U235 – 80.1 MBq
  - U236 – 2.4 GBq
  - U238 – 12.4 MBq
- e) When transported by Air the total activity of the isotopic content shall not exceed:
  - Pu 238 – 3 TBq
  - Pu 239 – 34.6 GBq
  - Pu 240 – 3.0 TBq
  - Pu 241 – 57.3 TBq
  - Pu 242 – 0.146 TBq
  - Am 241 – 3 TBq
  - Th 232 – 4.07 MBq
  - U 233 – 5.38 GBq
  - U234 – 0.232 TBq
  - U235 – 1.2 MBq
  - U236 – 2.4 GBq
  - U238 – 12.4 MBq

- f) Mixtures of these nuclides are permitted providing the sum of the proportionate amounts of each nuclide with respect to the limits shown in 1.2 d) or 1.2 e), as appropriate, does not exceed unity and providing that the fissile restrictions given in 1.3 are complied with.

### 1.3 Fissile Material Restrictions

Unless the contents of the package and/or consignment meet the requirements of paragraph 672 of IAEA TS-R-1 2005 Edition, the packages shall comply with the following fissile material approval:

#### Fissile Material Approval H1

- a) Fissile Material: Uranium, plutonium or mixtures thereof in any form.

The total mass of plutonium (all isotopes) and total U235 shall not exceed 1kg per package.

The uranium may be of any enrichment.

The Pu241 content of the plutonium shall not exceed the Pu240 content.

- b) Conditions:
- (i) up to 30g of hydrogen from all sources (including hydrogen bound in compounds of fissile material) may be present
  - (ii) up to 20g each of beryllium, graphite and D<sub>2</sub>O may be present.
  - (iii) Apart from as allowed by (i) and (ii) above no materials having an atomic mass less than 14 may be present in the 2851 containment vessel, apart from boron of which is unlimited.

**c) CRITICALITY SAFETY INDEX (CSI) = 0 (zero)**

- d) Criticality safety submission: Serco Assurance report SA/NDT/19733/R01 Issue 2 "Criticality Assessment of Package Design No. 2816H" dated 12 September 2007.
- e) This package has been shown to be sub-critical following water ingress as required by Paragraphs 677 and 678 of IAEA TS-R-1 2005 Edition. Special features to exclude water are not therefore required.
- f) The criticality safety case (see (d) above) assumes that the uranium and plutonium contains only those isotopes limited in (a) above. Other radionuclides present as the result of irradiation and reprocessing were not considered in order to maximise neutron multiplication.
- g) Air transport restrictions: The package has not been shown to be subcritical under the conditions specified in IAEA TS-R-1 2005 Edition, paragraph 680. The package may

not, therefore, be transported by air unless the contents are non-fissile or fissile excepted (see paragraph 4.3).

h) Only the fissile materials specified in sub-paragraph (a) above are permitted to be present, other than in trace quantities, that is to say up to either a total of 1 g per package, or a concentration of 0.1% by mass of the total fissile nuclides present.

i) Nuclides other than those defined in IAEA TS-R-1 2005 Edition, paragraph 222 as fissile materials are not restricted unless so specified above.

j) Where parameters are not qualified as maxima, minima or ranges, the values given are to be within the tolerances specified on the relevant drawings.

#### 1.4 Package Dimensions and Weights

a) Nominal Dimensions: 425 mm diameter x 1000 mm long (see section 5 for package illustration)

b) Maximum authorised gross weight: 147 kg

### 2. USE OF PACKAGE

#### 2.1 Use of packaging

a) The packaging shall be used and handled in accordance with the requirements of CPI 121 issue D dated 12 September 2007.

b) The packaging shall be maintained in accordance with the requirements of CSP 068 issue A dated 7 November 2006.

#### 2.2 Supplementary Operational Controls

a) The accessible surfaces of the package must not exceed 85°C. Suitable measures (such as the use of a light metal canopy to prevent access to the package surface) must be taken to ensure that no access can be gained to surfaces with a temperature in excess of 85°C.

b) The package shall not be sheeted over or over-stowed by loose cargo.

c) The package is not required to reach thermal equilibrium before shipment.

d) A single package may be shipped without a stillage providing it is laid horizontal and strapped and chocked to prevent movement in the transport vehicle during routine conditions of transport.

### 2.3 Actions prior to shipment

- a) 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 instructions on the use of the packaging.

### 2.4 Emergency Arrangements

- a) Before shipment takes place, the consignor shall have drawn up suitable emergency plans, copies of which shall be supplied to the UK Competent Authority on demand.
- b) 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 the local ~~NAIR~~ (National Arrangements for Incidents Involving Radioactivity) establishment.

### 2.5 Ambient temperature range for package design

- a) -40°C to +38°C

## 3. QUALITY ASSURANCE

- 3.1 Quality assurance programmes applicable to this design are:
  - a) Croft Associates Ltd Quality Management System; and
  - b) any other quality assurance programmes associated with the design, manufacture, testing, documentation, use, maintenance and inspection, and for transport and in-transit storage operations, that also comply with national or international standards for quality assurance which are acceptable to the authority named on page 1 of this certificate.
- 3.2 No alterations shall be made to the quality assurance programmes associated with this design and approved by the authority named on page 1 of this certificate unless that alteration has the prior approval of said authority, or it falls within the agreed change control procedures of that programme.
- 3.3 No quality assurance programme shall be used at any stage of the design, manufacture, testing, documentation, use, maintenance and inspection, and for transport and in-transit storage operations, unless said programme forms part of or is the quality assurance programme approved by the authority named on page 1 of this approval certificate.

#### 4. ADMINISTRATIVE INFORMATION

##### 4.1 Other Related Certificates (Alternative Radioactive Contents)

Other related UK certificates using the 2816 outer are shown below: -

Certificate Reference & Issue	Certificate Type	Expiry Date
GB/2816G/B(U)F-96 Issue 1	Design	28/02/2009

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

##### 4.2 Additional Technical Data / Information

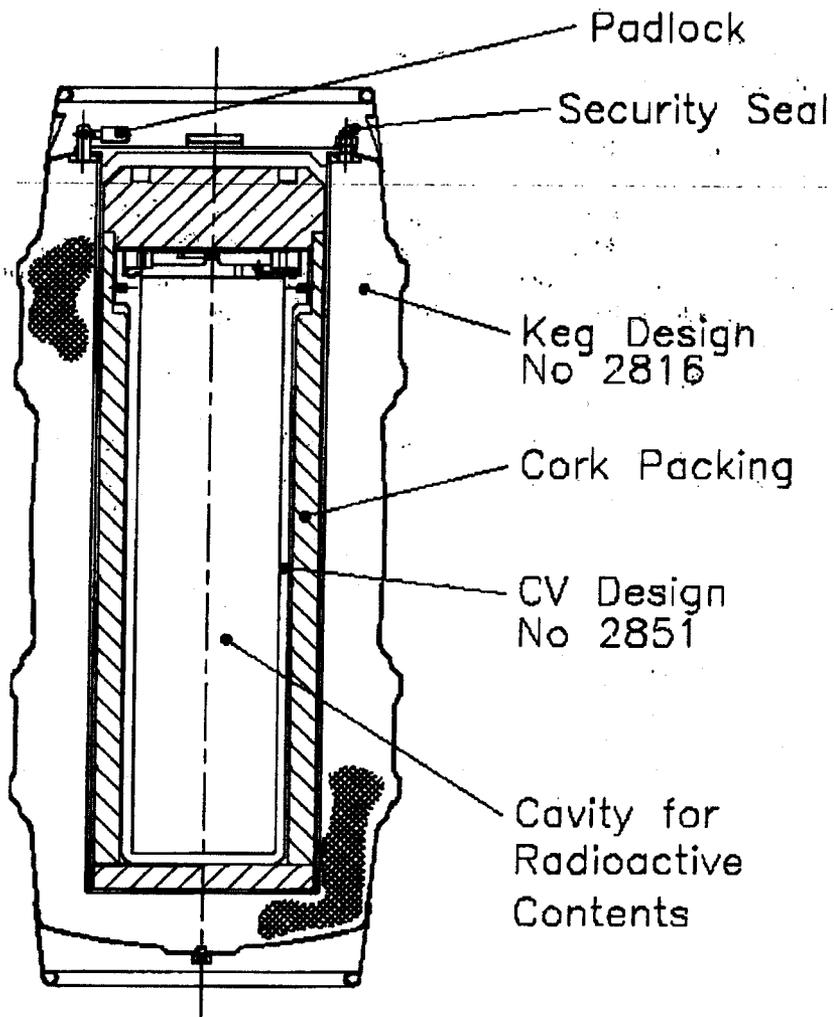
- a) At the time of compilation of this design approval certificate, The Ionising Radiations Regulations 1999, SI 1999 No 3232 and Approved Code of Practice apply, with regard to radiation protection, to all modes of transport and The Dangerous Substances in Harbour Areas Regulations 1987, SI 1987 No 37, apply in UK Ports

##### 4.3 Non-fissile or fissile excepted

- a) If the actual content carried in the package is non-fissile or fissile exempt material, then this certificate can be regarded as a Type B(U)-96 approval, with the corresponding Competent Authority Identification Mark as indicated on page 1 of this certificate.

5. PACKAGE ILLUSTRATION

Package Design No 2816H



**6. CERTIFICATE STATUS**

Design Approval issued to:-  
Croft Associates Ltd  
Building F4  
Culham Science Centre  
Abingdon  
Oxon  
OX14 3DB

Issue No.	Date of Issue	Date of Expiry	Reason for Revision
1	13 December 2006	31 December 2009	First application for a new design.
2	As date stamp on page 1	31 October 2012	Revision to allow fissile contents.

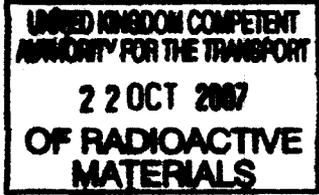
<b>COMPETENT AUTHORITY APPROVAL OF CHANGES TO PACKAGE DESIGN</b>	CN No 031 Issue B
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Package Design No 2816H	Colloquial Name SAFKEG	Mod or NCR No
Certificate No GB 2816H/B(U)F-96	DSR Ref No DSR 2816H-96 issue D	

Proposed Changes	Category: A/B/C: Amendment/Concession
<p>Update Packaging Contents Specification PCS 031 to increase the mass of thorium that may be carried in the package from 1 kg to 20 kg and to also increase the allowable mass of U 238 from 1 to 10 kg.</p>	

Supporting Documentation:	
Document No PCS 031 Issue F	Document Title Package Contents Specification for Package Design Number 2816H
Signed <i>[Signature]</i> (Responsible Officer)	Date 16/10/07

Competent Authority Comments
<i>Contents Specification PCS 031 issue G is approved to increase the Thorium 232 and Uranium 238 contents allowed under certificate GB/2816H/B(U)F-96 Issue 2</i>

The proposed change is:  <input type="checkbox"/> Approved <input checked="" type="checkbox"/> Not Approved  under the terms of the existing approval(s)	Name <i>D. VINCE for J. STEWART.</i>  Sign <i>[Signature]</i>  Date <i>22 October 2007.</i>	Competent Authority Approval Stamp  
	Approval received by letter facsimile E-mail:  Received by:	Date:



U.S. Department  
of Transportation

**Pipeline and  
Hazardous Materials  
Safety Administration**

East Building, PHH-23  
1200 New Jersey Avenue SE  
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**CERTIFICATE NUMBER:** USA/0752/B(U)F-96, Revision 0

**ORIGINAL REGISTRANT(S):**

Dr. Robert Vaughan  
President  
Croft, Inc.  
240 Camino Encantado  
Los Alamos, 87544  
USA