U.S. Department
of Transportation
Pipeline and
Hazardous Materials
Safety Administration

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

# COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U) RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/0382/B(U)-96, REVISION 21

## REVALIDATION OF UNITED KINGDOM COMPETENT AUTHORITY CERTIFICATE GB/2835A/B(U)-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[1] and the United States of America[2].

1. Package Identification - Croft Associates Model 2835A.

2. Package Description and Authorized Radioactive Contents - as described in United Kingdom Certificate of Competent Authority GB/2835A/B(U)-96, Revision 3 (attached). Contents are limited to special form capsules containing not more than 344 Tbq (9300 Ci) of Iridium 192, 0.11 Tbq (3 Ci) of Co-60, 520 Tbq (14,050 Ci) of Cs-137, or 438 TBq (11,800 Ci) of Se-75 in configuration and shielding containers as described in Croft Associates, "Package Contents Specification for Package Design No. 2835A", PCS 029, Issue F (attached). Maximum heat load is 57 watts.

3. 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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[1] "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.

[2] Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

d. Records of Quality Assurance activities required by Paragraph 310 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.

4. Special Conditions -

a. Due to its involvement in a transportation incident, serial number 5 is not authorized for use under the provisions of this certificate.

b. Package must be handled and operated in accordance with Croft Associates "Packing and Handling Instructions for Package Design No. 2835A", CPI 015, Issue P.

c. Package must be inspected and maintained in accordance with Croft Associates "Serviceability Checks on Package Design No. 2835A", CSP 009, Issue K.

d. Maximum heat load for the package is 57 watts.

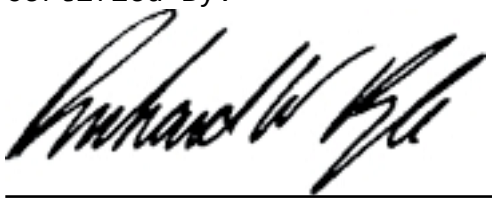
5. Marking and Labeling - The package shall bear the marking USA/0382/B(U)-96 in addition to other required markings and labeling.

6. Expiration Date - This certificate expires on July 31, 2021.

**CERTIFICATE USA/0382/B(U)-96, REVISION 21**

This certificate is issued in accordance with paragraph 808 of the IAEA Regulations and Section 173.473 of Title 49 of the Code of Federal Regulations, in response to the August 22, 2016 petition by Croft Associates Limited, Abingdon, Oxfordshire, UK, and in consideration of other information on file in this Office.

Certified By:



**Sep 14 2016**

William Schoonover (DATE)
Acting Associate Administrator for Hazardous Materials Safety

Revision 21 - issued to endorse United Kingdom Certificate of Competent Authority GB/2835A/B(U)-96, Rev. 3.

Office for Nuclear Regulation

# 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

approve the package design specified in Section 1 of this certificate, as submitted for approval by Croft Associates Ltd (see Section 5)

as: Type B(U)-96

by: road and rail in Great Britain; sea; air; and road in Northern Ireland.

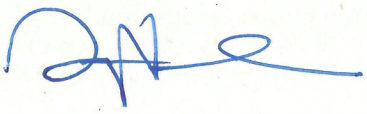
Packaging identification: SAFKEG Design No. 2835A

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 cancels all previous revisions and is valid until the end of 31st July 2021 (see Section 5).

COMPETENT AUTHORITY IDENTIFICATION MARK: GB/2835A/B(U)-96

Signature: 

Date of Issue: 01 August 2016

Steve Vinton, Superintending Inspector
Office for Nuclear Regulation
Redgrave Court, Merton Road
Bootle, Merseyside
L20 7HS

on behalf of the Office for Nuclear Regulation; and 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) 2015 Edition

Intergovernmental Organisation for International Carriage by Rail (OTIF)
Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2015 Edition

International Maritime Organization (IMO)
International Maritime Dangerous Goods (IMDG) Code 2014 Edition incorporating Amendment 37-14

International Civil Aviation Organization (ICAO)
Technical Instructions for the Safe Transport of Dangerous Goods by Air 2015-2016 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 1854 (M) The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form: Amendment 37-14 to the International Maritime Dangerous Goods (IMDG) Code

***AIR***
The Air Navigation Order 2009 (SI 2009 No. 3015); The Air Navigation (Dangerous Goods) Regulations 2002 (SI 2002 No. 2786); The Air Navigation (Dangerous Goods) (Amendment) Regulations 2015 (SI 2015 No. 970)

## 1. DESIGN SPECIFICATION

### Package Design

1.1 The package design specification shall be in accordance with Croft Associates Ltd Safety Report reference DSR 2835A-B(U)-96 Issue E dated 6th July 2016, 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 |
|---|---|---|---|
| 2835 | Outer/ Keg (1) | DL-1C-5401 | D |
| 2784 | Inner/ Pot (1) | DL-1C-5401 | D |
| N/A | Inner/ 2835A Insert (1) | 2C-7573 | B |

### Package Description and Materials of Manufacture

1.3 The Safkeg is based on stainless steel rolled sections, and carry containment vessels including shielding pots or re-sealable containment cans. See Appendix 1 for package illustration.

### Package Dimension and Weights

1.4 Nominal dimensions: 541mm high x 425mm dia.

1.5 Maximum authorised gross weight: 127.1kg

### Authorised Contents

1.6 The authorised radioactive contents are as follows:

a) Solids as powder, dried cake, or metal pieces as Competent Authority approved Special Form Radioactive Material, in either elemental oxide or carbide form.
b) The maximum permitted heat load is 57W.
c) Loads containing mixed radionuclides are not permitted.
d) Activities not to exceed the values in PCS 029 Issue F dated 13th May 2016, and in the table below:

| Isotope | Inner Container 2784 Max Activity (TBq) |
|---|---|
| Ir-192 | 344 |
| Co-60 | 0.11 |
| Cs-137 | 520 |
| Se-75 | 438 |

### Containment System

1.7 The containment system consists of the Special Form nature of the radioactive material, the pot, the lid and the inner O-ring seal.

## 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 CPI 015 Issue P dated 6th July 2016.

2.2 The packaging shall be maintained in accordance with CPI 015 Issue P dated 6th July 2016 and CSP 009 Issue K dated 6th July 2016.

**Actions Prior to Shipment**

2.3 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.

**Supplementary Operational Controls**

2.4 When the package contents exceed 59.7TBq of Iridium -192, 90.3TBq of Caesium -137 or 152.3TBq of Selenium -75 the package shall be stowed such that there is an air space between it and surrounding cargo to allow dissipation of heat.

2.5 Internal furniture must conform to the design specified in CPI 015 Issue P dated 6th July 2016.

**Range of Ambient Conditions for Package Design**

2.6 The range of ambient conditions for this package is -40°C to 38°C

**Emergency Arrangements**

2.7 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.

2.8 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 Croft Associates Ltd Safety Report reference DSR 2835A-B(U)-96 Issue E dated 6th July 2016 referred to in Section 1 above, and comprise the following:

- Croft Associates Ltd Quality Management System Manual.

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

**Packaging Serial Numbers**

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

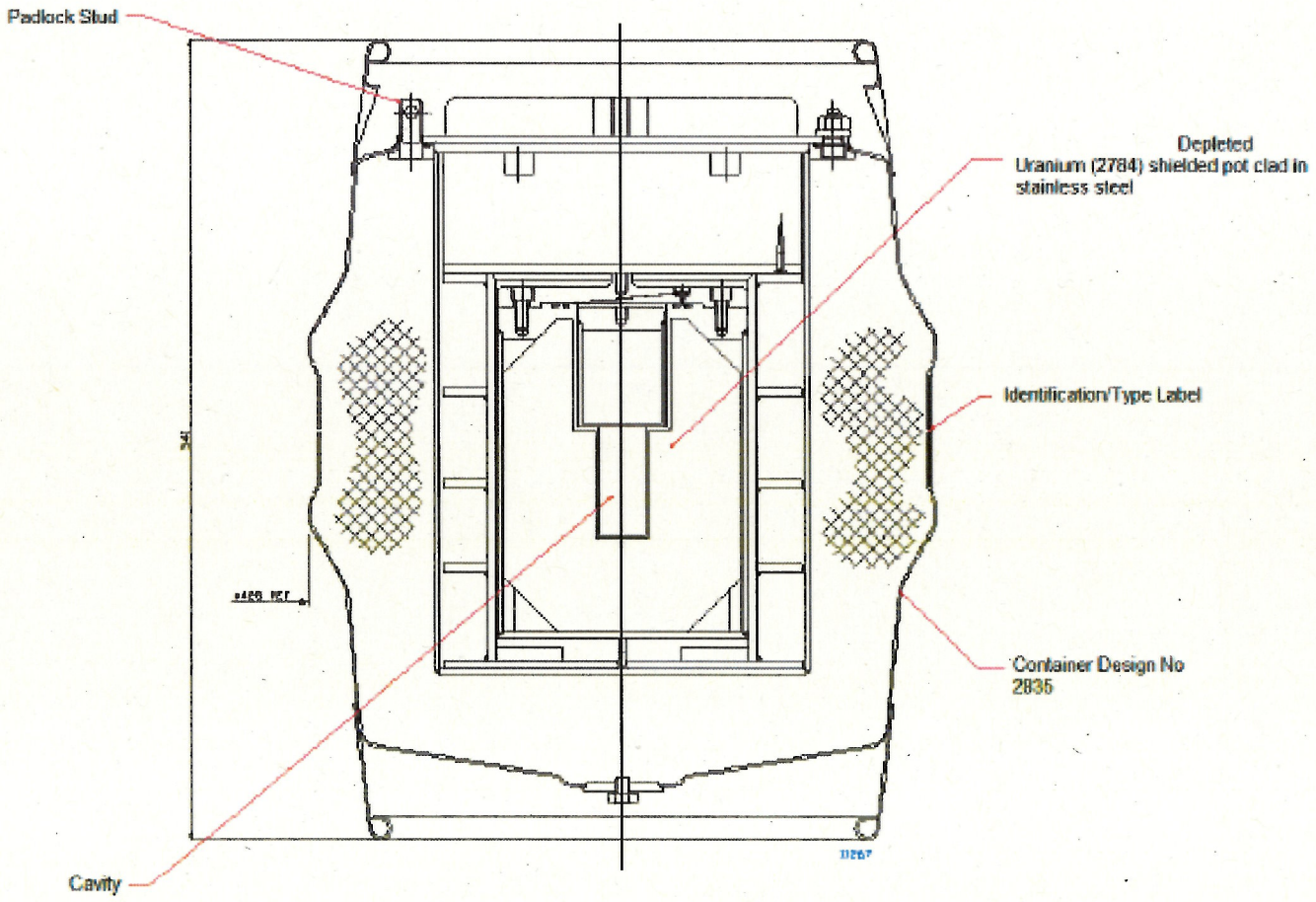
## 5. CERTIFICATE STATUS

**Design approval issued to:**

Croft Associates ltd
F4 Culham Science Centre
Culham
ABINGDON
Oxfordshire
OX14 3DB
UK

| Issue / Revision Number | Date of Issue | Date of Expiry | Reason for Revision |
|---|---|---|---|
| 1 | 14 January 2004 | 31 January 2007 Extended by letter to 31 July 2007 | Design approval issued under new regulations |
| 2 | 4 July 2007 | 31 July 2012 Extended by letter to 31 October 2014 | Renewal incorporating the addition of Selenium-75 as a new content. |
| 3 | 01 August 2016 | 31 July 2021 | Renewal on expiry of previous certificate |

## APPENDIX 1 – PACKAGE ILLUSTRATION



# Package Contents Specification for Package Design No 2835A

## Contents Type 1

| | | | |
|---|---|---|---|
| Title | Package Contents Specification for Package Design No 2835A<br><br>Contents Type 1 | Number | PCS 029 |
| | | Issue | F |
| | | File Reference | PCS029-F-d3-2835A contents specification.docx |
| Compiled | | Checked | |
| | A L Ferguson | | R A Vaughan |
| Approved | | Date | 13/05/2016 |
| | A L Ferguson | | |
| Croft Associates Ltd, F4 Culham Science Centre, Abingdon, Oxon, OX14 3GY UK Tel +44 (0)1865 407740 | | | |

# 1 Specification of contents

## 1.1 General nature of contents

The package is required to carry small quantities of Iridium, Cobalt, Caesium or Selenium in solid form, within approved Special Form capsules.

These capsules must be packed centrally within the shielded pots (for example, by the use of source carriers), such that they cannot “rattle” around within the cavity.

## 1.2 Radionuclides Included

See Column 1 of tables 1, 2 and 3.

## 1.3 Physical state

Solids or powders.

## 1.4 Chemical composition

Materials in either elemental, oxide or carbide form.

## 1.5 Quantity

The maximum quantity of radioactive material is arbitrarily set at 1.1kg.

## 1.6 Activity Limit

1.6.1 The package activity limits for individual nuclides are given in Tables 1, 2 and 3, under Package Limits (Columns 14 & 15).

1.6.2 Where more than one radionuclide is present, the contents are limited as below:

a. 2784 Shielded Pot

Mixtures of the nuclides given in Table 1, which are individually limited by the Package Limit (Table 1 Columns 14 & 15) are limited such that the sum of the proportionate amounts of each nuclide with respect to the quantity shown does not exceed unity.

Note:

Any associated daughter products of the primary isotopes listed, although not specifically mentioned, are also permitted.

Trace quantities of activation products resulting from the production of Ir-192 (such as Ir-194), may also be present up to 0.1% of the listed limit.

b. Content activity to be limited such that the total heat emission is to be not more than 57 W (see section 2.2).

### 1.7 Primary Containers and Packaging

Suitable primary containers are metal cans or equivalent, that are compatible with the materials of the both the container and the radioactive contents.

## 2 Calculation of allowable contents

### 2.1 Criticality Limits

N/A.

### 2.2 Heat limits

The heat limit has been set at 57W.

### 2.3 Shielding limit

As the contents could contain γ emitters a shielding assessment has been performed, the results of which are summarized in Tables 1.

In Table 1, contents within the depleted uranium shielded pot (2784) are restricted such that external surface dose rates and TI (radiation level at 1m from the external surface of the package) do not exceed the regulatory limits for Non-Exclusive Use (paragraph 524 and 525 [1]).

### 2.4 Mass Limit

The upper limit on the contents mass is set at 1.1 kg.

The upper limit on the mass of any individual radionuclide has also been set arbitrarily at 1.1kg.

## 3 References

1. IAEA Safety Standards Series No SSR-6, Regulations for the Safe Transport of Radioactive Material, 2012 Edition.

| Nuclide | Element | A1 Value Ref 1 (Bq) | Specific Activity Ref 2 (Bq/g) | Criticality Limit | | Heat Output Ref 3 & Ref 4 (W/Bq) | Heat Limit | | Shielding Limit Ref 5 (Bq) | Mass Limit | | Activity limit for air transport 3000*A1 (Bq) | Package Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Bq) | (g) | | Watt Limit | Activity (Bq) | | (g) | (Bq) | | (Bq) | (g) | |
| Ir-192 | Iridium | 1E+12 | 3.40E+14 | N/A | N/A | 1.66E-13 | 57 | 3.44E+14 | 3.7E+14 | 1100 | 3.74E+17 | 3E+15 | 3.44E+14 | 1.01E+00 | |
| Co-60 | Cobalt | 4E+11 | 4.19E+13 | N/A | N/A | 4.17E-13 | 57 | 1.3676E+14 | 1.1E+11 | 1100 | 4.61E+16 | 1.2E+15 | 1.10E+11 | 2.62E-03 | |
| Cs-137 | Caesium | 2E+12 | 3.23E+12 | N/A | N/A | 3.02E-14 | 57 | 1.8887E+15 | 5.2E+14 | 1100 | 3.55E+15 | 6E+15 | 5.20E+14 | 1.61E+02 | |
| Se-75 | Selenium | 3.00E+12 | 5.38E+14 | N/A | N/A | 6.50E-14 | 57 | 8.7674E+14 | 9.07E+18 | 1100 | 5.92E+17 | 9E+15 | 4.38E+14 | 8.14E-01 | (ii) |

References

1 IAEA TS-R-1 Editions1996 (Revised) and 2005
2 IAEA TS-G-1.1 (ST-2)
3 Croft Associates, CS 2012/08
4 Croft Associates, CS 2006/41
5 Croft Associates, CTR 98/16

Notes

(i) A1 Values taken from Table I of TS-R-1 (Gamma/Beta emitting nuclides), Specific Activities calculated using formula from paragraph 240.2 in TS-G-1.1
(ii) Se-75 shielding limit, and therefore the package limit, arbitrarily divided by a factor of 2 to give a safety margin.

**Table 1: Activity Limits for Contents Type 1 within a 2784 Shielded Pot**

U.S. Department
of Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

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

**CERTIFICATE NUMBER:** USA/0382/B(U)-96, Revision 21

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