Federal Office for Radiation Protection (BfS)

License Certificate

D/4306/AF-96 (Rev. 16)

for a shipping container of Type A for fissionable materials

Based on the application of Company "Trauner Anlagen- und Montagebau GmbH" [Trauner System-design and Installation], Deggendorf, dated August 28, 2010 (Ref. : TS-la), the container with the container designation **RA-3D Shipping Container** is licensed as a shipping container of Type A for fissionable radioactive materials in accordance with the following regulations for carriers by road, rail, sea and inland waterway:

Regulations for the Safe Transport of Radioactive Material, 2009 Edition, International Atomic Energy Agency (IAEA), No. TS-R-1,

European Convention on the International Transport of Dangerous Goods by Road, dated September 30, 1957, (ADR) (BGBl. 1969 II, pg. 1489), last changed by the 20th ADR change regulation, dated Oct. 2, 2009 (BGBl. 2009 II, pg. 1114,

Regulation for International Transport of Dangerous Goods by Rail (RID) - Attachment I to Appendix C of the Convention on International Rail Transport (COTIF), dated May 9, 1980 (BGBl. 1985 II, pg. 130), in the version of the notification dated May 16, 2008 (BGBl. 2008 II, pg. 475), changed last by the 15th RID change regulation dated December 22, 2009 (BGBl. 2009 II, pg. 1290).

International Maritime Dangerous Goods Code (IMDG Code), Amendment 34-08.

Regulation regarding the transportation of dangerous goods on the river Rhine (ADNR), dated July 12, 2003 (BGBl. II, pg. 648), last changed by the 8th ADNR change regulation, dated June 17, 2009 (BGBl. 2009 II, pg. 595); Appendix to the European Convention on international transport of dangerous goods on Inland Waterways (AND), dated May 26, 2000 (BGBl. 2007 II, pg. 1906), changed last by the 1st AND change regulation, dated June 5, 2009 (BGBl. 2009, pg. 534),

Regulation on the National and International Transport of Dangerous Goods on Roads, by Rail and on Inland Waterways (Regulation on Dangerous Goods on Roads, by Rail and Inland Waterways - GGVSEB), dated June 17, 2009 (BGBl. I, pg. 1389). Changed last by Art. 1 of the 5th change regulation for dangerous goods regulations, dated August 3 2010 (BGBl. 2010, pg. 1139),

Regulation on the Transport of Dangerous Goods by Sea ships (Regulation on Dangerous Goods on Sea - GGVSee), dated February 22, 2010 (BGBl. 2010, pg. 238), changed last by Art. 2 of the 5th change regulation for dangerous goods regulations, dated August 3, 2010 (BGBl. 2010, pg. 1139)

In conjunction with the Guidelines of the Federal Minister of Transportation, Construction and Housing (BMVBW) dated November 17, 2004 (VkBl., 2004, 594) and the BMVBS notification in respect to regulations relative to the Dangerous Goods Regulation, dated July 1, 2010 (VkBl., 2010, pg. 282).

It is confirmed that the Federal Office for Radiation Protection (BfS), Salzgitter, is the authority authorized by the Federal Ministry of Transportation, Construction and Housing pursuant to Section 7.9 of the IMDG Code.

Licensee: Company "Trauner, Maschinen und Montagebau GmbH"
Hengersberger Strasse 189
94459 Deggendorf

Documents:

1. Safety Report No. NCS 0015, Rev. 1, dated May 2005 and its Amendment No. NCS 0216, Rev. 0, dated December 2002, both documents prepared by NCS GmbH,

2. Inspection certificate of Federal Office of Material Research and Testing (BAM), Berlin, dated June 11, 2002 (File: III 3/20554) and BAM expert position, dated August 12, 2003 (File III 3/20954), June 29, 2005 (Az.: III.3/21114) and May 23, 2008 (Az.: III.3/21270). And November 5, 2010 (Az.: III.3/21302).

In respect to the Criticality Analyses we refer in particular to the Chapter 7 and Sections 9.4 and 10.4 of the Safety Analyses Report NCS 0015; Chapter 7 of the supplemental Safety Analyses Report NCS 0216, and the following working reports:

- *Criticality Safety Analysis for the RA-3D Shipping Container with Generic 9x9 Fuel Assemblies with Cluster Separators, Lukas Trosman, dated May 30, 1995*

- *Criticality Safety Analysis for the RA-3D Shipping Container with Generic 10 x 10 Fuel Assemblies with Cluster Separators, Lukas Trosman, dated May 26, 1995*

- *Criticality Safety Analysis for the RA-3D Drop Test Assessment, F.G. Welfare, W.C. Peters, dated July 19, 1999*

- *Criticality Safety Analysis for the RA-3D Shipping Container with Generic 10 x 10 Fuel Assemblies with Cluster Separators, Addendum 2: 4.55% Enriched Lattices with 9 (2%) Gad Rods, DRF No. 311-02567-03, W.C. Peters, dated Nov. 24, 1999*

- *Criticality Safety Analysis for the RA3D Shipping Container For Use with GNF-2 Fuel Design, eDRF N0. 0000-0009-6103, GNF, dated October 2002, with Amendment dated September 2003*

Manufacturer's designation: **RA-3D Shipping Container**

Identifier: **D/4306/AF-96**

Validity of the license: **until and including December 31, 2015**

Criticality Safety Index (CSI): **0,278**

Permissible content:
The content shall be, by the intent of the above quoted regulations, unirradiated Uranium in one of the following forms:

1. Max. 2 unirradiated fuel assemblies for boiling-water reactors, 9 x 9 type, containing max. 74 fuel rods with UO_2 pellets and Zircaloy cladding tubes, and 2 water rods, in a square lattice arrangement. The cross-section of a fuel assembly is 161.3 cm^2, the maximum active length of the fuel rods is 381 cm, the maximum uranium-235 mass per fuel assembly is 8.980 kg and the maximum uranium-235 enrichment (by mass) is 5%. The maximum pellet diameter (of the fuel rod) is 0.965 cm and the minimum thickness of the cladding tube is 0.0584 cm. Depending on the average U235 enrichment in the fuel rod matrix, the fuel bundles must contain the number of required absorber rods given in Table I, instead of pure UO_2 rods. Absorber rods are UO_2 fuel rods that contain gadolinium in the form of Gd_2O_3 as neutron absorber.

Table I
Gd rods required in 9x9 Fuel Assemblies

Average uranium-235 enrichment E in the fuel lattice (%)	Required min. number of absorber rods	Min. mass percentage of Gd_2O_3 per absorber rod (%)
$E \leq 3.00$	None	-
$3.00 < E \leq 3.30$	2	2
$3.30 < E \leq 4.15$	6	2
$4.15 < E \leq 4.60$	8	2

2. Max. 2 unirradiated fuel assemblies for boiling-water reactors, 10 x 10 type, containing max. 92 fuel rods with UO_2 pellets and Zircaloy cladding tubes, and 2 water rods, in a square lattice arrangement. The cross-section of a fuel assembly is 161.3 cm^2, the maximum active length of the fuel rods is 381 cm, the maximum uranium-235 mass per fuel assembly is 9.725 kg and the maximum uranium-235 enrichment (by mass) is 5%. The maximum pellet diameter is 0.891 cm and the minimum thickness of the cladding tube is 0.052 cm. The fuel rods can be partial length rods. Depending on the average U235 enrichment in the fuel rod matrix, the fuel bundles must contain the number of required absorber rods specified in Table II, instead of pure UO_2 rods. Absorber rods are UO_2 fuel rods that contain gadolinium in the form of Gd_2O_3 as neutron absorber. For determining the required number of absorber rods, only such rods are to be counted which contain the specified Gd content at minimum over a length, which is equal to the largest active length of any fuel rod within the fuel bundle.

Table II
Gd rods required in 10x10 Fuel Assemblies

Average Uranium-235 enrichment E in the fuel lattice (%)	Required min. number of absorber rods*	Min. mass percentage of Gd_2O_3 per absorber rod (%)
$E \leq 2.80$	None	-
$2.80 < E \leq 3.20$	2	2
$3.20 < E \leq 3.60$	5	2
$3.60 < E \leq 4.00$	8	2
$4.00 < E \leq 4.55$	9	2
$4.55 < E \leq 4.70$	12	3

* *The required absorber rods must be arranged symmetrically with respect to the diagonal of the fuel assembly, which passes through the 10 rod positions of the fuel assembly.*

Type of Package:

According to the above cited BAM, Berlin, certificate and the above mentioned BAM expert positions, the construction of the RA-3D Shipping Container meets the requirements imposed on a Type A shipping container for fissionable materials with respect to the mechanical and thermal characteristics.
With respect to criticality and radiation shielding, the shipping container was reviewed by BfS and meets the requirements for a Type A shipping container for fissionable material (IAEA Regulations §§ 633 and 671).

In the criticality analysis, penetration of water into all hollow spaces, under accident conditions, was assumed.

Description of the package:

The shipping container (Model RA-3D) consists of a wooden, rectangular crate (outer container), which is lined on the inside with cardboard honeycomb material (min. 0.518 m^3), and Ethafoam (min. 0.12 m^3), and an inner container made of stainless steel (material 1.4541), which holds the two fuel assemblies. The outer container is closed by use of a screwed-on cover.
In addition the cover is being secured with 5 steel bands, which are wound around the wooden container. The front sides of the wooden container are reinforced by steel plates.
The inner container, which consists of a lower body, cover and end cap, contains two U-shaped chambers into which the two fuel assemblies are placed. The cover and lower body are connected to each other by 14 "Camloc" clamps along the long sides and by 2 additional clamps along the ends. As an alternative to the use of the 16 clamps, connection of the cover and the lower body by 14 bolted connections is possible.
In addition the cover of the inner container is secured by 4 steel bands, which are wound around the inner container.
4 load-attachment points for horizontal transport and 2 for vertical transport are welded to the lower container body. The outer container does not have load-attachment points; it is transported with a forklift or cable suspension tackle. In between fuel rods, plastic separators, 'Cluster Separators', can be used to protect the fuel rods.

The tight enclosure is formed by the fuel cladding of the bundle.

The enclosure system is formed by the inside container with its closure system, the fuel bundles and the cluster separators.

Outside dimensions: approx. 5251 mm x 756 mm x 787 mm.

Mass:	Outside container ca. 400 kg, Inner container ca. 400 kg, total mass of the loaded transport container max. 1390 kg

This certificate is based, at this point in time, on the respective drawings and their revisions as listed in Appendix 3 (see also Special Provisions item No. 9)

Special provisions and notes:

1. If a polyethylene foil is used to wrap the fuel assembly, it must not project beyond the Upper or Lower Tie Plate of the fuel assembly and it must not be tacked or folded in such a way that the ingress or discharge of liquid into or out of the fuel assembly is hindered.

2. Polyethylene shims may be placed between the fuel rods during transport if the equivalent water density of 0.1 g/cm^3, relative to the fuel assembly's volume, is not thereby exceeded.

3. All quality-assurance measures during design/planning, in-process inspections and operation must comply with the BAM Dangerous Goods Regulation "Measures for Quality Assurance of Licensed Type Packages for Transporting Radioactive Material" (BAM-GGR 011, Rev. 0).

4. For manufacturing of new containers, only the highest drawing revisions numbers, as listed in Appendix 3, are to be used, incl. special provision No. 9. Manufacturing can only be initiated following the submittal of the documents listed in BAM-GGR 011, and the corresponding BAM release for manufacturing.

5. This license is valid only in conjunction with the acceptance certificate issued for the corresponding packages, which shall be submitted to BAM and the BfS without their request. BAM acceptable deviations, in accordance with BAM-GGR 011, as well as changes made in acc. with Special Provision 9, have to be listed in the certificate. For already manufactured containers, the deviations tolerated by BAM and the changes according to Special Provision 9, have to be documented in the Inspection Book of the package(s).

6. It shall be ensured that each user of the package, prior to the first use thereof, is registered at BfS and confirms that it has received and will comply with the inspection book, which contains in particular the license certificate, the loading, packaging, operating and maintenance instructions, and the surveillance inspection procedure. Special attention shall be paid to:

   Specification GE 14000, Rev. 7 from GNF including the Packaging Data Sheet PDS 402 (Rev. 3) and Packaging Data Sheet No. PDS 414 (Rev. 0).

   The use of documents with a higher revision index, is only acceptable, in the context of this license, if these revisions have been released by BAM and BfS approval has been issued.

7. Every package has to be subjected to surveillance testing in due time. For packages, which are used exclusively outside the Federal Republic of Germany, the surveillance testing can be performed and certified by the inspectors which are licensed by the

respective Country Authorities. The certificates of the performed surveillance tests have to be submitted to BAM and BfS without their request.

8. Each individual package shall be permanently marked with the above-indicated identifier and the date (month, year) of the next surveillance inspection.
9. Changes in the drawings, parts lists and material data sheets, on which this license is based, must be released by BAM and approved by the BfS prior to manufacturing in the form of a change approval or an extended list (acc. to Attachment 3). Thereby they will become part of this license.
10. The license D/4306/AF-96 (Rev. 15) remains in effect until April 30, 2011.
11. This license does not relieve the shipper from the obligation to comply with appropriate regulations of the government of a country through which or within which the shipping container is transported.

Costs:

1. Based on § 12, Para. 1 and 2 of the Law regarding the Transport of Dangerous Goods (GGBefG), in the version dated July 7, 2009 (BGBl. 2009 I, pg. 3975), in conjunction with Article 1 and Attachment (to Article 1), Part I, registration number 007 of the Regulation regarding Cost for Measures to be taken for the Transport of Dangerous Goods (GGKostV), dated November 13, 1990 (BGBl. I, pg. 2490), last changed by the 3rd Regulation for Changes to the Regulations on Dangerous Goods, dated December 17, 2004 (BGBl. I, pg. 3711, costs - fees and charges - will be charged for this notification.
2. In accordance with § 12, Para. 1 of GGBefG, in conjunction with § 13, Para. 1, No. 1 of the Administrative Costs Law (VwKostG), dated June 23, 1970 (BGBl. I, pg. 821), last changed by Art. 3 of the Law for Changes of Third Party Requirements to the Nuclear Law and for Changes of other Legal Requirements, dated August 29, 2008 (BGBl. 2008, pg. 1793), the costs must be borne by "Trauner Anlagen- und Montagebau GmbH" [Trauner System Design and Installations],
3. The cost determination shall be made in a separate notification.

Legal remedy:

Objections to this ruling may be raised within one month after its announcement.
The objection shall be filed with the Federal Office for Radiation Protection (BfS), Willy-Brandt-Str. 5, 38226 Salzgitter, in writing or to be recorded in writing.

Salzgitter, December 15, 2010

signed by

Dr. Reiche

[SEAL: FEDERAL OFFICE FOR RADIATION PROTECTION]

Attachments:
Appendix
Attachment 1: Drawing No. 0453 E 91 Rev. 4, "RA3D Inner Shipping Container"
Attachment 2: Drawing No. 0456 E 91 Rev. 5, "Outer Shipping Container"
Attachment 3: Drawing List

- Appendix to the License Certificate D/4306/AF-96 (Rev. 15) -

Rev. No.	Issue date	Period of validity	Reason for revision
0	May 5, 1992	May 31, 1995	First issue
1	May 18, 1993	May 31, 1996	Extension of the permissible content. Changes in the sections on Regulations and Documents. Extension of the period of validity. Supersedes Revision 0 of the license.
2	January 13, 1994	July 13, 1997	Revision of the license with changes in the following sections: Drawings, Documents, Permissible Content, Description. New period of validity. Supersedes Revision 1 of the license.
3	January 22, 1996	January 31, 1999	Revision of the license with changes in the following sections: Transport regulations, Documents, Permissible content, Transport identifier, drawings, container figures, new period of validity. Note: The period of validity of Rev. 2 of the License Certificate is limited to July 31, 1996.
4	April 30, 1998	January 31, 1999	Revision of the permit with changes in the following Sections: Transport regulations, Documents, Permissible content Note: The period of validity of Rev. 3 of the License Certificate is limited to July 31, 1998.
5	February 3, 1999	September 30, 1999	Revision of the permit with changes in the following Sections: Transport regulations, Documents, Period of validity, Description of the package, Costs
6	November 24, 1999	September 30, 2000	Revision of the permit with changes in the following Sections: Transport regulations, Documents, Period of validity, Description of the package, Drawings, Permissible content, Secondary provisions and notes, Container figures

7	February 29, 2000	September 30, 2000	Change in the Sections: Documents, Permissible content (Table II), Costs; Note: The period of validity of Rev. 6 of the License Certificate is limited to July 31, 2000.
8	September 13, 2000	December 31, 2000	Extension of the period of validity; validity Rev. 7 of the license is limited to September 30, 2000.
9	December 1, 2000	June 30, 2001	Extension of the period of validity Changes in the following Sections: Documents, Description of the Package, Drawings; Note: Rev. 8 of the license remains valid to December 31, 2000
10	July 25, 2001	December 31, 2001	Extension of validity period; Changes to following Sections: Documents, Secondary Provisions and Notes
11	October 24, 2001	June 30, 2002	Extension of validity period; Changes to the following Sections: Documents, Secondary Provisions and Notes; Remark: Rev. 10 of the license remains valid until December 31, 2001
12	July 17, 2002	July 31, 2005	Revised and changed to the new transport regulations; Changes to the following Sections: Regulations, Documents, Identifier, Validity of the License, Secondary Provisions and Notes
13	Sept. 19, 2003	Sept. 30, 2006	Changes to the Sections: Regulations, Documents, License Validity, Permissible Content, Type of Package, Drawings, Secondary provisions and notes, Note: Rev. 12 of the license remains valid until July 31, 2004
14	July 7, 2005	July 31, 2008	Changes to the Sections: Regulations, Documents, License Validity, Type of Package, Description of Package, Special provisions and notes, Note: Rev. 13 of the license remains valid until Dec. 31, 2005
15	June 30, 2008	June 30, 2011	Revision and extension of the validity duration; Changes in Paragraphs: Transport Regulations, Documents, Permissible Content, Description of the Package, Special provisions and notes); Note: Rev. 14 of the license remains valid until July 31, 2008
16	Dec. 15, 2010	Dec. 31, 2015	Extension of the validity duration; Changes in Sections: Transport regulations, Special Provisions & Notes,; Note: Rev. 15 of the license remains valid until April 30, 2011

Attachment 1 to the license D/4306/AF-96 (Rev. 16):
Drawing No. 0453 E 91 Rev. 4, "RA3D Inner Shipping Container"
(actual drawing)

Attachment 2 to the license D/4306/AF-96 (Rev. 16):
Drawing No. 0456 E 91 Rev. 5, "Outer Shipping Container"
(actual drawing)

Attachment 3 to the license D/4306/AF-96 (Rev. 16):

Drawing List of the
RA3D Shipping Container

RA3D Containers which were/are manufactured according to the following drawings are meeting the requirements of this license (see also "Special provisions and notes" No's 4, 5 and 9)

Drawing Set No.	Drawings - Revisions	Released by BAM
0	GNF Drwg. No 0456 E 91 (Rev. 5) – Outer Shipping Container – with additional GE drawing No 0457 E91 (Rev. 2) GNF Drwg. No. 0453 E 91 (Rev. 4) – RA3D Inner Shipping Container – with its detailed drawings No. 0454 E 91 (Rev. 2), No. 0455 E 91 (Rev. 1), No. 0558 D91 (Rev. 1), No. 0559 D91 (Rev. 1), No. 0560 C91 (Rev. 2), and the materials list 3W 524601 (Rev. 2) GNF Drwg. No. TR 160 52460 D98 (Rev. 3) – Outer and inner container, arrangement of steel straps and end supports on outer Container – with its material list 3W-923601 (Rev. 0) GE Drwg. No. 0078C95 (Rev. 0) for the "Cluster Separators" to be optionally used in fuel assemblies.	Expert position, dated June 29, 2005 (Az.: III.3/21114)

Salzgitter, December 15, 2010

Dr. Reiche

[SEAL: FEDERAL OFFICE FOR RADIATION PROTECTION]