



Westinghouse Electric Sweden AB

S-721 63 Västerås, Sweden

## Decision

Our date: 1 July 2016  
Your reference:  
Case no.: SSM2016-3235  
Document no.: SSM2016-3235-2  
Case officer: Michael Wallin  
Tel.: +46 8 799 4287

# Approval of package design for transport of radioactive material

## The Swedish Radiation Safety Authority's Decision

The Swedish Radiation Safety Authority (SSM) approves with support from applicable transport regulations, reference 2-4, the below package construction for transport on Swedish territory or under Swedish jurisdiction, on roads, railways and at sea.

The package's identity label:	S/50/IF-96 (Rev. 8)
Package type:	IP-3 for fissile material
Criticality safety index:	0.5
Designation:	EMBRACE

This certificate is valid through 30 August 2019.

The description of package type and conditions for its use are indicated in Annex 1.

This certificate does not absolve the sender from meeting any and all regulations in the countries through which or in which the package is transported.

## The case

On 27 June 2016, Westinghouse Electric Sweden AB (WSE) submitted an application for an extension of the current package construction certificate for the EMBRACE packaging.

## Reason for the decision

The transport regulations in ADR-S, RID-S or the IMDG code specify that for transports of class 7 substances, the relevant authority is to issue a certificate for package construction when an application is submitted. Based on section 18, second paragraph, regulation (2006:311) on transports of hazardous materials, SSM evaluates these types of cases.

The review in reference 5 has been conducted. SSM has determined that conditions have been met to issue the requested certificate indicated in the application under the limitation and terms specified in Annex 1.



## Fee

The fee for this confirmation of certificate for the package construction is SEK 37,000, in accordance with 5 § 17 regulation (2008:463) on certain fees for the Swedish Radiation Safety Authority.

## Appealing a decision

For information on appealing this decision, see Annex 2.

The decision in this case was taken by Acting Unit Manager Helmuth Zika. Inspector Michael Wallin has handled the final processing of the case.

**SWEDISH RADIATION SAFETY AUTHORITY**

Helmuth Zika

Michael Wallin



## References

### *Transport regulations*

1. Regulations for the Safe Transport of Radioactive Material. IAEA Safety Standard Series No. SSR-6 (Vienna 2012).
2. The Swedish Civil Contingencies Agency's regulation, Domestic Carriage of Dangerous Goods by Road and Off-road, ADR-S, (MSBFS 2015:1).
3. The Swedish Civil Contingencies Agency's provisions on the transport of dangerous goods by rail, RID-S (MSBFS 2015:2).
4. The Swedish Transport Agency's regulations and general advice on maritime transport of dangerous goods in packaged form (the IMDG Code), (TSFS 2015:66).

### *Technical documentation*

5. Certification documentation for Embrace transport packaging, UAM 06-023, rev 5, with annexes. Westinghouse Electric Sweden AB.
6. E Mennerdahl Systems. Review report EMS/TP/2013-05



# Annex 1

## I Description of the packaging

The packaging is a modified variation of RA-2/3, intended for BWR fuel cartridges and fuel rods. It consists of an outer container made of wood and an inner container made of stainless steel, separated by impact-absorbing material. The packaging is to be constructed in accordance with the drawing Westinghouse Atom AA 281255 revision 5 and the details specified in this drawing. Figure 1 shows a drawing of the packaging.

The packaging has the following data:

Length outer container	5290 mm
Width outer container	885 mm
Height outer container	886 mm
Tara weight inner container	370 kg
Tara weight outer container	555 kg
Tara weight complete packaging	925 kg
Gross weight complete packaging	max. 1525 kg

The containment system consists of the complete packaging (reference 1, § 209).  
The fuel rods' containment system consists of the casing (reference 1, § 213).

## II Description of allowed contents

### *Allowed contents I*

The contents may consist of no more than two unirradiated and complete BWR fuel elements of type SVEA 96, containing hardened uranium oxide pellets with or without gadolinium oxide. The fuel rod casings are to be made of a zirconium alloy. Pipe-shaped pellets may not be present.

Each of the fuel elements is to be equipped with a fuel box and the fuel element is to be manufactured for use in a nuclear power plant.

Fissionable material is to meet requirements for LSA-II alternatively LSA-III, in accordance with references 2-4.

Any plastic sleeves to protect the fuel cartridges are to be open at both ends and may not reach outside the ends of the fuel cartridges. The plastic may not be bent or taped in a way that can stop the free flow of water in and out of the cartridge.

Each individual package may contain at most 10 kg of plastic or rubber material.

The highest allowed enrichment of Uranium 235 is indicated in Table 1. The contents are to meet the specifications in Table 1 and Table 2.



Table 1

	Fuel elements without BA rods	Fuel elements with BA rods
Enrichment of Uranium 235 in pellets, max	5.0 weight %	5.0 weight %
Enrichment of Uranium 235 in node <sup>1)</sup> , max	4.05 weight %	5.0 weight %
Number of Gd <sub>2</sub> O <sub>3</sub> rods, min		6 <sup>2)</sup>
Content Gd <sub>2</sub> O <sub>3</sub> in pellets, min	-	1.95 weight %

1) A node is an approx. 16 cm axial length (a cross-section) of the fuel element, with a specific spread in enrichment and a specific number of BA rods.

2) If two BA rods are immediately beside each other, only one may be counted as a BA rod. Any BA rods placed in the outer rod positions are not counted. The BA rods are to be symmetrically placed in relation to a diagonal. To be counted as a BA rod, a BA rod may only contain Gd<sub>2</sub>O<sub>3</sub> pellets.

Table 2

Amount of uranium per element, max	209.5 kg
Total weight fuel element, max	300 kg
Number of fuel rods per element, max	96 pcs.
Rod lattice, width, max.	134.2 x 134.2 mm
Centre distance between rods, max	13.3 mm
Active length, max.	4000 mm
Density of UO <sub>2</sub> pellets, max.	10.96 g/cm <sup>3</sup>
Density of pellets with Gd <sub>2</sub> O <sub>3</sub> , min.	7.0 g/cm <sup>3</sup>
Rod radius, min.	4.87 mm
Pellet radius, max.	4.25 mm
Pellet radius for pellets with Gd <sub>2</sub> O <sub>3</sub> , min.	4.23 mm
Thickness of casing, min.	0.56 mm

#### *Allowed contents II*

The contents may consist of loose fuel rods, intended for BWR fuel elements of type SVEA 96, containing hardened uranium oxide pellets with or without gadolinium oxide. The fuel rod casings are to be made of a zirconium alloy. Pipe-shaped pellets may not be present.

The rods are to be placed in no more than two inner stainless steel transport boxes intended for use for this purpose. The boxes are to conform to the drawing Westinghouse Atom AAP 10901 revision 4. If one of the boxes is not completely filled with fuel rods, the remaining space is to be filled with zirconium alloy pipes to ensure a tightly packed lattice.



Fissile material is to meet requirements for LSA-II alternatively LSA-III, in accordance with references 2-4.

Each individual package may contain at most 10 kg of plastic or rubber material. The contents are to meet the specifications in Table 3.

Table 3

---

Enrichment Uranium 235 in pellets,	5.0 weight %
Amount of uranium per box, max.	209.5 kg
Number of rods per box, max.	96 (max. 192 rods per package)
Rod diameter	8.90 – 12.5 mm
Pellet diameter	7.54 – 11.14 mm
Thickness of casing, min.	0.56 mm

---



### **III Transport requirements**

All applicable parts of references 2-4 are to be followed.

Applicable instructions for handling and regular inspection are to be followed.

### **IV Quality assurance**

Steering documents for quality assurance of the packaging concerning construction, manufacture, testing, documentation, use, maintenance and inspection are to be maintained up-to-date.

### **V Accident preparedness**

In case of accident on Swedish territory, immediately contact the Swedish Radiation Protection Institute (SSM) by phone at +46-(0)8-799 40 00. After office hours, contact *the on call radiation protection inspector* at SSM at the emergency alarm number +46-8-454 24 66.

For smaller accidents or other events that are of importance from a radiation protection standpoint, a report on the events are to be submitted immediately, but no later than two (2) weeks after the event to the Swedish Radiation Safety Authority.

### **VI Use of this certificate**

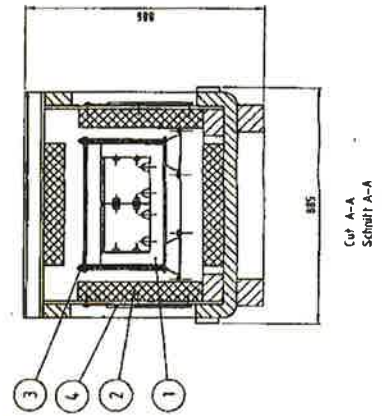
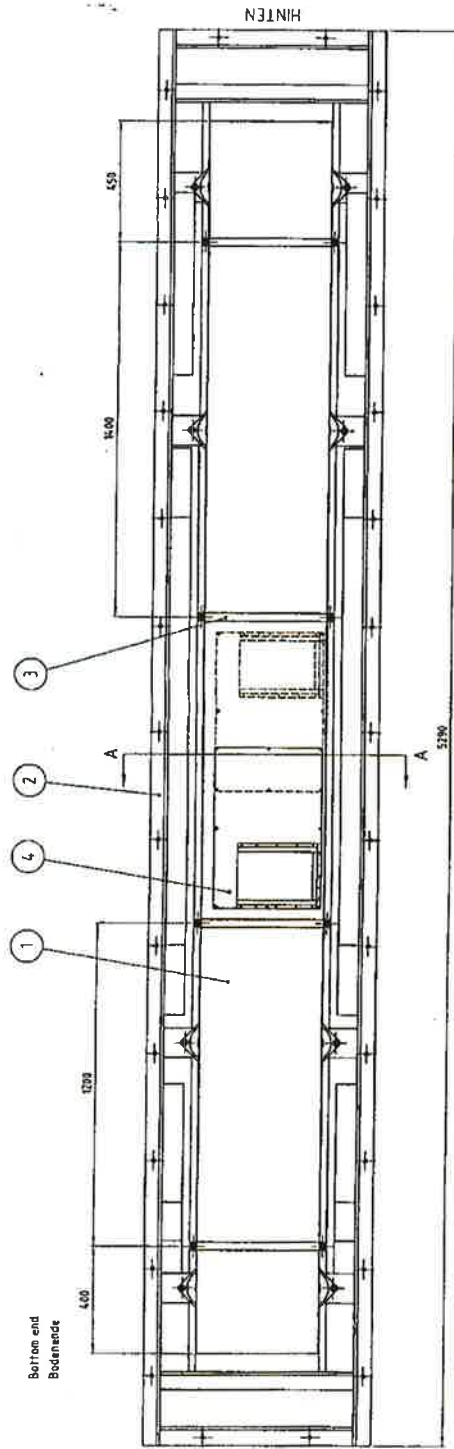
This certificate can also be used by someone who has received permission from the original certificate applicant and received a copy.



**Revision list**

Revision no.	Date of issue	Comments
0	15 Dec 2000	First edition
1	25 Jan 2001	Change of Allowed contents I, with respect to approved fuel types
2	14 Oct 2003	Upgrade to IF-96 Change of Approved content I Change of Approved content
3	30 Aug 2006	Extended period of validity without substantial
4	2 May 2007	Extended period of validity without substantial
5	18 Jun 2007	
6	4 Jun 2010	Extended period of validity without substantial changes
7	14 Jun 2013	Extended period of validity without substantial changes. Technical nomenclature according to TNC 90
8	1 July 2016	Extended period of validity without substantial changes.







## Annex 2

### **Appealing a decision**

The Swedish Radiation Safety Authority's decisions can be appealed to the Administrative Court in Stockholm. Appeals are to be submitted in writing to the Swedish Radiation Safety

Authority,  
171 16 Stockholm. Street address: Solna strandväg 96, Stockholm, Sweden.

Indicate in the written appeal the decision's case number, how you would like the decision changed and the reason for the change. The appeal is to have been submitted to the Swedish Radiation Safety Authority within three weeks of receiving notice of the decision, otherwise, the appeal will not be processed.

The Swedish Radiation Safety Authority will forward the appeal to the Administrative Court in Stockholm for review if the authority does not change the decision in the way you request.