

The new generation of the MOSAIK[®] casks

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Introduction:

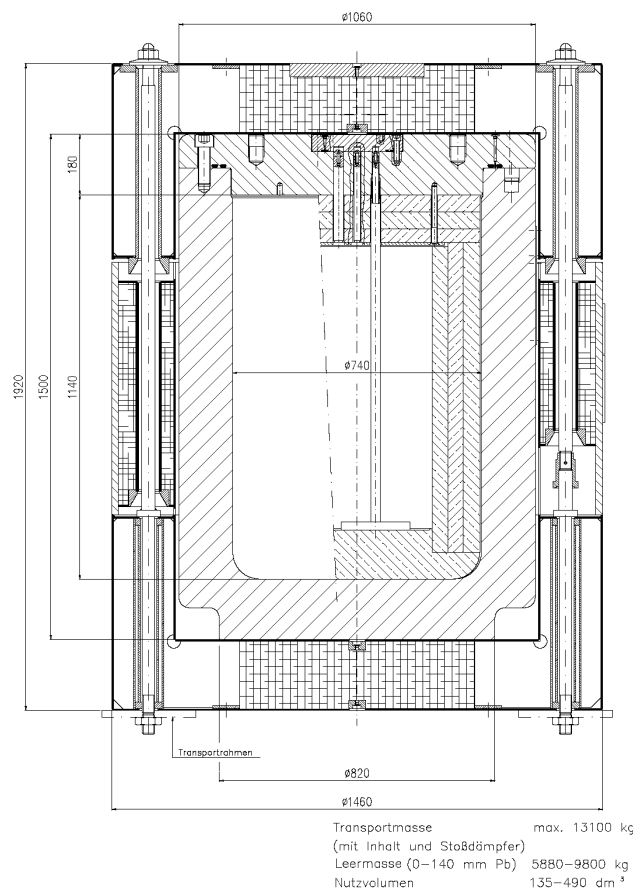
MOSAIK[®]-casks were developed for the transport of different types of radioactive waste. Furthermore, the casks are to be used for a safe interim storage over a longer period of time and finally for the final storage in an adequate final storage facility. The name MOSAIK[®] comes from the German

Mobiles System für aktivierte Kerneinheiten
(mobile system for activated core components)

Three cask types were developed in the beginning. These are:

MOSAIK[®] I \varnothing 900 mm, 1150 mm
MOSAIK[®] II \varnothing 1060 mm, 1500 mm
MOSAIK[®] III \varnothing 1000 mm, 1240 mm

Meanwhile, the MOSAIK[®] casks were produced over 5000 times. Approx. 10% were MOSAIK[®] I and III casks that were built as IP-2 resp. type A casks. The first MOSAIK[®] II-15, type B(U), was approved in 1987. Picture 1 shows this cask.



Picture 1: MOSAIK[®] II-15 cask

The most important data for this cask is shown below:

dimensions:	Ø 1060 mm, 1500 mm
wall thickness: Body	160 mm
Lid, Bottom	180 mm
material:	cast iron with nodular graphite
additional shielding:	up to 140 mm lead
inventory:	core components, fuel elements, sources, incore measuring staff, contaminated metal parts, resins, concentrates
inventory mass:	max. 1340 kg
activity: (Co-60)	max. 9,0 E14 Bq
important nuclides:	Co-60, Co-58, Mn-54, Nb-95, Zr-95, Ag-110m, Sb-125, Cs-134, Cs-137/Ba-137m
transport mass:	12650 kg
transport per freight container:	2 casks
loading:	atmosphere, hot cells, under water
cask type:	transport, interim and final storage cask

Table 1: Data of the MOSAIK® II-15 cask

The cask has an shock absorber system consisting of three parts (picture 2).



Picture 2: MOSAIK® II-15 with the impact limiter

Two further types of MOSAIK® casks that were only developed for the transport of metal parts, are the:

MOSAIK® 80 T

for the transport of water guide boxes

MOSAIK® 80 T/SWR-SE

for the transport of control rods



Picture 3: MOSAIK® 80T/SWR-SE on transport device

The development of the new generation:

From 1987 until today approx. 9 different cask type approvals as type B(U) packages for the different cask types were obtained. However, during the last years only 4 of these cask types were built in high numbers. These are:

- 1) D/2060/B(U)-85
 - MOSAIK® II-15
 - MOSAIK® II-15 U
 - MOSAIK® II-15 TISAR
 - MOSAIK® II-15 T/F ISAR
- 2) D/2083/B(U)-46
 - MOSAIK® II-15 (Pb 90-140 mm)
 - MOSAIK® II-15 U (Pb 90 – 140 mm)
- 3) D/2090/B(U)-96
 - MOSAIK® II-15 EI
 - MOSAIK® II-15 U EI
- 4) D/2088/B(U)-96
 - MOSAIK® II-15 P/U

It can be assumed that for the remaining 5 approvals no casks will be needed in the future. Casks built according to this approval are stored at the nuclear power plants in their interim storage. In order to secure a further transport of these casks, the approvals are renewed in rotation – an approval for 5 years is strived for. This is possible for approvals that have been given according to the 1996 IAEA Regulations. It can however be said that for all of these loaded casks (after interim storage) the activity decay is so low that a type B(U) approval is not necessary any more. The casks can be transported as type A package.

Taking the future development into account, a concept for the 4 above-mentioned approvals was made. The 4 casks are to be dealt with in 1 approval and the feasibility is coordinated with the BAM and the BfS. Following goals are to be reached:

- reduction of the number of cask types
- unification of the sealing system
- maximum wall thickness (lead) of 140 mm for all cask types
- increase of the permissible inventory mass

2003 the application for approval was made at the BfS. The documents are being checked by the BAM at the moment.

Following goals were reached:

The number of cask types was reduced from 9 to 3

This was achieved by naming some parts, such as filter elements as an alternative in the parts lists. Furthermore, casks of the same type having a different inventory have been summarized in one approval

All casks have a parallel sealing system

Most of the casks developed up to now have an axial and a radial sealing in the lid. The new cask type has only one parallel sealing system.

All cask types can be produced with up to 140 mm of lead in steps of 10 mm

Lead shielding from 0 to 80 mm or from 90 to 140 mm was used in some cask types. The new cask types allow lead shielding from 0 to 140 mm.

The permissible inventory mass was increased by using a steel lid instead of a cast iron lid.

Cask types had a mass limit of the inventory of max. 860 kg. The new cask type allows an additional loading of 1340 kg by using a steel lid. By improving the conditioning procedures, in this case the pressing of metal part, e. g. water carrying boxes, a higher additional loading is necessary in order to fill the casks completely. The cast iron lid used up to now can be used further, the permissible inventory mass is however then limited at 1240 kg.

Cask tests:

In order to gain the approval for the MOSAIK® cask, extensive tests were performed in the past 20 years. Following tests will be shown in a film:

- drop onto a penetrating bar
- bumping test at the Deutsche Bahn testing site in Minden
- drop of a cask cooled down to -20°C
- 9 m drop onto the lid of the cask (performed at the BAM testing site)

Approval for the interim storage facility Gorleben:

A special approval procedure is required for the interim storage facility in Gorleben that also requires a drop from 5 m height. This drop test is to be made without shock absorbers. The stress for the cask is therefore higher than during the drop tests resp. the drop from 9 m height using shock absorbers. Furthermore, the security of the cask when an airplane crashes on it proven. This prove is made mathematically. Up to now the different cask types were approved by the GAA Lüneburg for the interim storage facility Gorleben in approx. 50 revisions of the parts lists.

Approval as Konrad-cask:

The cask tests for their suitability in the final storage Konrad are covered according to the transport regulations and the tests made for the storage facility in Gorleben. Additionally a fire test (one hour) is required. We will ask for approval for the MOSAIK® II-15 casks for Konrad shortly.