Compliance Assurance Aspects for Type-A and Industrial Packages

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During the last 2 years BAM has been involved in the approval of large freight containers for the transport of radioactive material. The experience we have obtained during this time we would like to present in this short report.

IAEA defines a container as a piece of transport equipment of an enclosed, rigid, and strong character. It is designed to facilitate the carriage of goods by one or more modes of transport without intermediate reloading.

Detailed requirements are included in ISO 1496/1 and in the CSC-agreement, where we can find the explicit indication for additional requirements for the transport of dangerous goods, and we think, there are some remarkable differences for containers for Class 7 dangerous goods compared with containers for general purpose cargo:

- The drop test, combined with the condition "the specimens shall have suffered such damage as will lead to the maximum damage," is no longer representative for routine conditions or for minor mishaps during transport. In our opinion a dynamic impact force at a shunting yard is much more representative.

- Container, load, and tie-down attachments cannot be considered isolated, because this system suffers dynamic loads, which seems to be much more stringent for the construction than one isolated drop test.

- The total cargo weight of a container usually is much greater than the weight of a single packaging. That means that we have to think about additional requirements for the securing of the cargo to avoid a damage of the packaging in case of a movement of the cargo within the packaging.

- Vice versa, the necessity of securing the cargo has the result that there are also requirements for the cargo with respect to the possibility for a securing.

- A freight container has a relatively long sealing surface, about 12 m,

approximating a 20 foot container with double leaf door. It is much more difficult to achieve the same tightness with such a container than with a 200 l drum. Also in our opinion much more important is the direction, in which the tightness is supposed. Usually the gasket has to avoid the penetration from outside the container. But in opposition to this, for Class 7 containers we consider with regard to IAEA the release of cargo material much more than some penetration from outside. Additionally, the function of the enclosure of cargo is normally constructed with regard to general purpose cargo and less for bulk.

Bearing this in mind, we can see that the most important design criterion is to withstand dynamic transport loads without dispersal of contents and not to withstand against the drop test like other types of packaging. The drop test is not an appropriate test scenario for a large freight container. The freight container-specific tests are the ISO-Standard 1496/1 criteria, with the additional requirement of assessing dynamic impact forces (shunting); but during these tests it has to be determined if the requirement "no loss or disposal" is fulfilled.
This dynamic impact requirement is included in the 1996 edition of IAEA SS6, but without recommended values for the acceleration /1/.

In Germany, the requirements are: 2 g in longitudinal, 1 g in lateral, and 2 g in vertical direction. We support, also, that the containers fulfill the requirements of ISO and CSC. But it has to be considered that in CSC the test for weather-proofness is missing.

Now some words on the remarkable details of the licensing procedure. The appropriate design is demonstrated in the simplest way with a longitudinal dynamic restraint test (rail impact test). The tightness of the doors and their gasket is demonstrated with sand near the container doors. For detection of deformation a visual inspection is sufficient. Additionally we look for the behavior of the cargo. This happens for the verifications of the IAEA requirement "no decrease of the shielding of more than 20 %." The test of the side wall and the roofs were performed with a pillow, blown up by air. When a form-closed tie-down attachment is chosen, all the walls have to withstand the forces resulting from accelerations of the cargo. The lower parts of the doors are especially critical with regard to the release behavior during short but heavy dynamic loads.
For a force-closed attachment, it is necessary that the tie-down points be designed to withstand the resulting forces.

Another part of the review before the issue of our certificate is the determination of the quality assurance measures for the fabrication process, the use, and the reinspection of the freight container. The basis for the acceptance of the fabrication process by BAM is the fabrication and test plan. Some items of this plan are shown in the picture 1. Steps of the acceptance inspections at the end of the fabrication are shown in picture 2. This inspections proceeds by a third-party inspector.
We also expect procedures for use, maintenance, and reinspection. In the

picture 3 you can see some examples for items in these procedures. The reinspection by the third-party inspector proceeds with the same detail as the commissioning test.
Now some remarks as to future development. We are of the opinion that the assessment of large freight containers to be used for packages of type IP-2, IP-3, or A is connected with very complex technical questions and public concern that require competent authority approval. But following the decision of the IAEA revision process that no competent authority approval will be mandatory for IP- and Type A-packagings, that requirement will also be dropped in Germany. Therefore in the future the manufacturer himself or the consignor has to demonstrate the compliance of the package design with the requirements. This has to be guaranteed by the compliance assurance system in Germany, picture 4.

/1/ Regulations for the Safe Transport of Radioactive Material, 1996 Edition, International Atomic Energy Agency (IAEA), Vienna

- control of packaging material after income
- control of the certificate of all welders and the welding filler material
- control of the welding process
- dimensional control
- dye penetration test

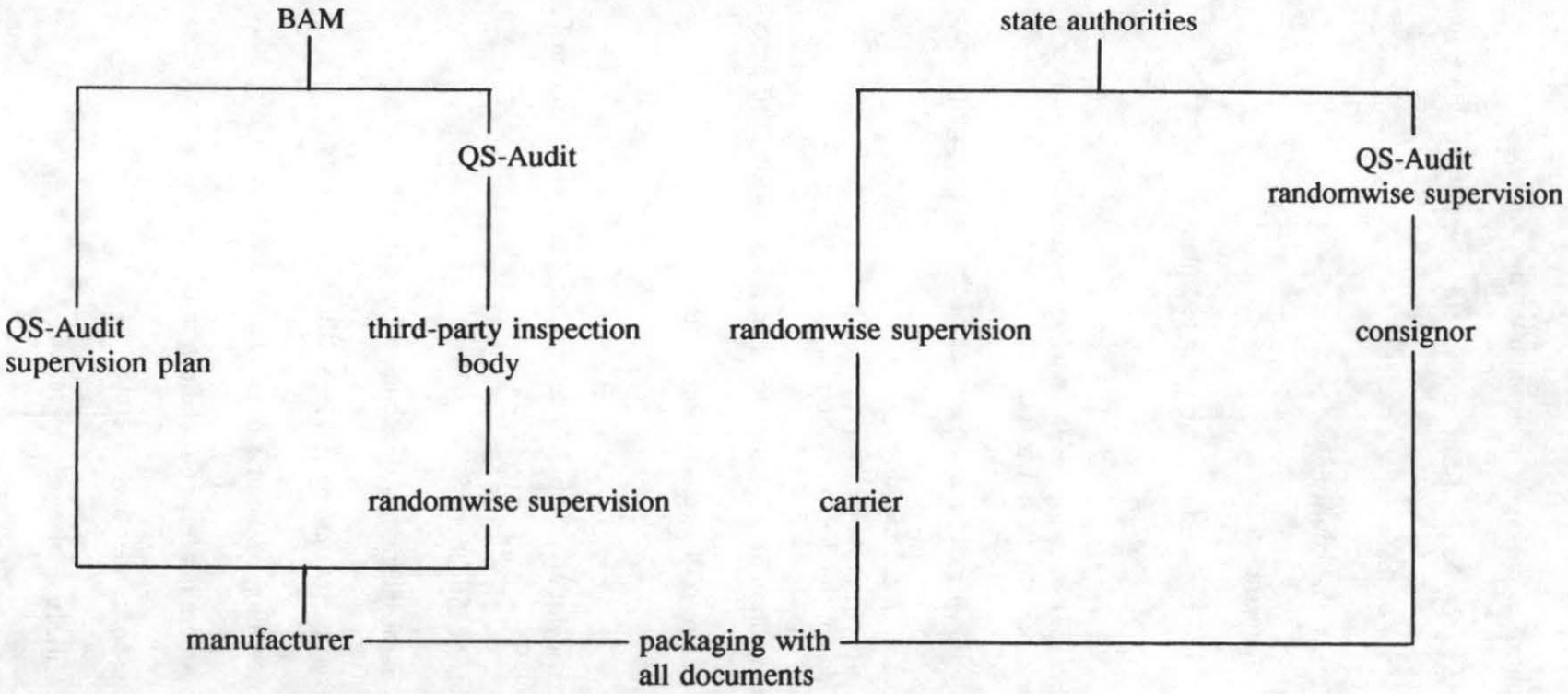
picture 1: Items of the fabrication and test plan

- dimensional control of the packaging according to the approved drawings, including the tie-down system
- functional control and tightness of the locking equipment
- control of the marking
- check of the documentation
- preparation of the acceptance certificate by the third-party inspector

picture 2: Steps of the commissioning test

- consideration of the "Guidelines for Packaging Cargo in Freight Containers or Vehicles"
- staff qualification
- visual inspection of the container and tie-down system
- cargo corresponding to the certificate of approval
- observation of the maximum load and the center of gravity
- consideration for the specification of tie-down attachments
- transport under exclusive use
- qualification of repair operations
- operations before inactive use

picture 3: Items for use and maintenance procedures



picture 4: Competent Authoriy Supervision