PROGRAMME TO DEVELOP A LARGE TRANSPORT CONTAINER FOR TRANSPORTATION OF
LARGE PIECES OF CONTAMINATED EQUIPMENT AND OF MEDIUM LEVEL WASTE

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ABSTRACT

A development programme, sponsored by the Commission of European Communities was carried out jointly by Transnubel SA Belgium and by CEA France, with the aim of developing a very large package that complies with IAEA regulations for the safe transport of radioactive materials. The packaging will be used for the transportation of contaminated equipment or waste from various types of nuclear installations. The main difficulty encountered in designing such packaging consists in ensuring the leaktightness of the containment system following a drop from a height of 1 m onto a rigid punch. Most severe damage undoubtedly occurs when a large surface hits the punch after the drop. Most of the drop energy is absorbed by the beam grid structure (245,000 Joules for a 1 m drop).

As a first approach, structural deformation was studied in reduced-scale tests. This demonstrated the necessity of reinforcing the beam frame. Work is now in progress to demonstrate that a design incorporating suitable insulating material can also comply with other IAEA regulations, such as that governing a 9 m high drop on an edge followed by a fire at 800°C.

SCOPE OF THE STUDY

A research programme, sponsored by the Commission of the European Communities was carried out jointly by Transnubel SA Belgium and by CEA France to develop a transport container that complies with IAEA regulations for the safe transport of radioactive materials. At present no such large package is available in Europe. As a result, following dismantling operations, transportation of most of the large-dimension contaminated equipment, such as glove-boxes, ventilation systems and filters requires the setting up of special arrangements, approved by the competent authorities. Furthermore, in the near future, an increasing
quantity of medium-level waste will have to be transported from reprocessing plants to final storage areas. A suitable transport container is thus required for transportation of both the dismantled parts and this waste. The resulting transport container will be adapted for use in transportation by both road and rail and will be submitted to the competent authorities for type B approval.

COLLECTION OF DATA AND REQUIREMENTS OF THE STUDY

On the basis of the answers obtained from an enquiry, sent to the main European nuclear installations, the following tentative parameters have been defined:

(1) Maximum gross weight and ISO standard dimensions: The gross weight of the package cannot exceed 25 T due to the 38 T weight limit for road vehicles, operating under normal transport conditions. The dimensions of a 20 feet ISO-container have been adopted.

(2) Package containment: A separate containment system, independent of the package's external steel frame and of its contents, has been chosen. It can be manufactured in various versions, adapted to the waste categories to be transported. For example, for 200-250 l drums, which, according to an enquiry, seem to be the most widely used, the containment can be a vertical vessel, held in a standard rack.

(3) Radiological protection: In the same way, the characteristics of the required radiological protection can be specified in terms of the contents to be transported. The containment will be fixed to the drum and will protect the handling personnel, not only during transportation, but also during loading operations and leakage controls.

RESEARCH FOR MATERIALS MEETING IAEA REGULATIONS

Following initial experiments, it seems clear that the 1 m high drop test represents the most difficult problem to be solved. Indeed the external container shell must withstand appreciable load. Deformation of the shock-absorbing materials must be limited to avoid any damage to the containment system, and too great a reduction in the usable volume.

Three punch tests were performed on various types of strengthened composite materials (C.M):

(a) C.M.1, corrugated iron sheet, scale 1/1.
Dimensions: 2,325mm x 1,560mm x 3mm.

(b) C.M.2, scale 1/3 (Figure 1).
Dimensions: 840 x 428 x 50mm.
Components: corrugated iron sheet: 1mm
Kevlar : 5mm
Tubes E24.2 : 20 x 20 x 1 mm
steel sheet : 1 mm

(c) C.M.3, scale 1/3 (Figure 2).
Dimensions: 840 x 428 x 50 mm
Components: steel sheet : 1 mm
aluminium honeycomb : 20.8 mm
Kevlar : 6 mm
Tubes E24.2 : 20 x 20 x 1 mm