DEVELOPMENT OF A TRANSPORT PACKAGE FOR HOT CELLS AND EXPERIMENTAL REACTOR WASTES

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OVERVIEW OF THE PRESENTATION

The CEA needs for a new type B(M) packaging

DE25 packaging description and performances

Preparation of the commissioning in the facilities

Description of the tools and operating scenarios

Conclusion
THE CEA NEEDS FOR A NEW TYPE B(M) PACKAGING

DE25 PACKAGING DESCRIPTION AND PERFORMANCES

PREPARATION OF THE COMMISSIONING IN THE FACILITIES

DESCRIPTION OF THE TOOLS AND OPERATING SCENARIOS

CONCLUSION
**Part of a CEA program to replace old packagings for waste transportation**

- **For which facilities?** Hot Labs and experimental reactors
- **What kind of wastes?** A variety of solid materials (tools, metallic samples, clothing,...) with possible hydrogen production (radiolysis)
- **Between which locations?** Waste production and disposal facilities not necessarily on the same research center
- **Taking into account new safety requirements**
# THE CEA NEEDS FOR A NEW TYPE B(M) PACKAGING

## Comparison with existing packagings (examples)

<table>
<thead>
<tr>
<th>Main characteristics</th>
<th>Model 1 (P15)</th>
<th>Model 2 (Am736)</th>
<th>DE25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>5 Tons</td>
<td>8.9 Tons</td>
<td>9.2 Tons 7.1 Tons w/o S.A.</td>
</tr>
<tr>
<td>Internal cavity</td>
<td>(\phi 400 \times 800 \text{ mm}^3)</td>
<td>(\phi 400 \times 720 \text{ mm}^3)</td>
<td>(\phi 400 \times 665 \text{ mm}^3)</td>
</tr>
<tr>
<td>Outer dimensions</td>
<td>(\phi 1440 \times 1470 \text{ mm}^3)</td>
<td>(\phi 1200 \times 1800 \text{ mm}^3)</td>
<td>(\phi 1800 \times 1980 \text{ mm}^3)</td>
</tr>
<tr>
<td>Loading: vertical, hot cell roof</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Loading: vertical, water pool</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Radiations protection</td>
<td>15 cm of lead</td>
<td>15 cm of lead</td>
<td>Equivalent to 15 cm of lead</td>
</tr>
<tr>
<td>Tight confinement</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Shock absorption capability</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Resistance to fire</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
THE CEA NEEDS FOR A NEW TYPE B(M) PACKAGING

Perennial solution for waste transportation (including dismantling wastes)

Road transportation capability

The DE25 packaging meets the following objectives

Accordance with new safety requirements and operational constraints

Rationalization of CEA packagings fleet (one single model to replace several ones, without any equivalent alternative)
To limit the design complexity, some operational functionalities have been taken back at the level of operating conditions.
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## Packaging constituted with:

- The main body, providing complete radiation protection, and an lateral shock absorber
- One lower and one upper shock absorbers

## Main figures

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Masses</strong></td>
<td><strong>Overall package mass: max 9200 kg</strong></td>
</tr>
<tr>
<td></td>
<td>Packaging body: 7100 kg</td>
</tr>
<tr>
<td><strong>Main dimensions</strong></td>
<td><strong>Overall: Ø1.8 m x 1.98 m</strong></td>
</tr>
<tr>
<td></td>
<td>Body only: Ø1.2 m x h 1.16 m</td>
</tr>
<tr>
<td></td>
<td>Internal cavity: Ø 400 mm x h 665 mm</td>
</tr>
<tr>
<td><strong>Transportable wastes</strong></td>
<td><strong>Max. container dimensions: Ø380 mm x h 620 mm</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Max container + wastes mass: 80 kg</strong></td>
</tr>
<tr>
<td></td>
<td>Max radiolysis waste mass: 15 kg</td>
</tr>
<tr>
<td></td>
<td><strong>Max activity for ^60^Co: 5 TBq (not under exclusive use) / 17.8 TBq (under exclusive use)</strong></td>
</tr>
<tr>
<td><strong>Data on dose equivalent rates for packaging</strong></td>
<td>Under exclusive use: 10 mSv/h max on contact</td>
</tr>
<tr>
<td></td>
<td>Under non-exclusive use:</td>
</tr>
<tr>
<td></td>
<td>- 2 mSv/h max on contact</td>
</tr>
<tr>
<td></td>
<td>- 0.1 mSv/h at a distance of 1 m</td>
</tr>
<tr>
<td><strong>Tightness performances</strong></td>
<td>&lt; 10^-4 Pa.m^3^/s SLR in pressure rise method</td>
</tr>
<tr>
<td></td>
<td>&lt; 10^-6 Pa.m^3^/s SLR in helium method for manufacturing control</td>
</tr>
</tbody>
</table>

## Content is loaded / unloaded:

- Vertically, from the bottom, by a winching tool
- After removal of the body lid and opening of the 2 drawers
Development of the DE25 transport package

- Upper shock absorber (#735 kg)
- Handling points (2x2 M30)
- Winching plug
- Body (#7100 kg)
- Internal cavity: Ø 400 mm x h 665 mm
- Drawers
- Bottom lid
- Lower shock absorber (#1175 kg)

**Color legend**

- Stainless steel (body)
- Stainless steel (shock absorbers)
- Wood
- Tungsten alloy
- Body removable parts
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CONCLUSION
A specific project set up to prepare the DE25 operation in the nuclear facilities

1. Specification of tools
   - Definition of operational scenarios
   - Writing of facilities safety reports

2. Design and provision of tools
   - Organisation of training tests
   - Preparation of operational procedures

3. First loading and transport
   - Real conditions
   - Internal authorisations

Comissioning
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## DESCRIPTION OF THE TOOLS AND OPERATING SCENARIOS

**Main steps**
- Shock absorbers removal/mounting
- Body lid removal/mounting
- Drawers opening/closing
- Content winching
- Leakage tests
- Handling
- Transport

**Reminder:** operational functionalities excluded from packaging design and taken back at the level of operating conditions

### One or several tool(s) for each operating step

<table>
<thead>
<tr>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spreader for the DE25 top shock absorber</td>
</tr>
<tr>
<td>Stand and stand trolley</td>
</tr>
<tr>
<td>Drawer remote opening tool</td>
</tr>
<tr>
<td>Winching set</td>
</tr>
<tr>
<td>Leakage tests set</td>
</tr>
<tr>
<td>Package spreader</td>
</tr>
<tr>
<td>Specific shock absorber</td>
</tr>
<tr>
<td>Specific pallets</td>
</tr>
<tr>
<td>Stowage structure and carrier straps</td>
</tr>
<tr>
<td>Tool boxes (type IP-2 industrial packagings)</td>
</tr>
<tr>
<td>Hand tools</td>
</tr>
</tbody>
</table>
Some tools...

Stand and stand trolley

Winching set

Stowage structure

Drawer remote opening tool

Specific shock absorber
Tools adapted to different facilities configurations

On hot cells roof
Package handled with winching set; in the foreground, see the specific shock absorber, and behind, the cell roof platform

Loading in a pool
Package handled with winching set; and equipped with drawer remote opening tools
Some operating steps

**DE25 package, tools boxes and socle arrival on the truck**

**Package spreader setting up**

**DE25 top shock absorber removal with slings**

**Body lid with the stand**

**Winching operation**

**Unlocking the packaging winching plug**

**Drawers opening**

**Setting up the winching set**

**Handling with the specific shock absorber**
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The DE25 is a six-year project, developed by CEA for its own needs.

It’s a type B(M) package (currently under assessment by French Nuclear Authority).

A new generation of design:

- A simple and compact packaging, compatible with various CEA facilities with: water pool, hot cell roof and storage well
- It weighs 9.2 tons for 80 kg of contents, for medium or high-level radioactive wastes, with maximum activity for 60Co up to 17,8 TBq under exclusive use
- Overall dimensions are 2 m in height and diameter

A significant work on operating conditions, scenarios and tools design, in association with CEA facilities users.

Many tests and operators training have been realized before the first in site packaging use.

The first in site transport has been performed in the CEA/Saclay center by the end of 2012.
THANK YOU FOR YOUR ATTENTION.