



Nuclear Transportation Package - Fire & Impact Testing



The Client

A global engineering company who design and manufacture packages to transport radioactive materials.

The Problem

Most packages that carry radioactive materials have to be licensed by the Department for Transport (DfT), now part of the Office for Nuclear Regulation. This requires the designer to demonstrate the package will contain the material in the event of an accident, which could include fire and impact damage. Our Client had predicted how the package would perform in an accident, but they needed to validate their work by carrying out tests.



What we did

Technical experts from HSL's Fire Safety and Engineering Safety teams designed a programme of experimental work to meet the specifications our Client had agreed with the DfT.

Firstly, we delivered a series of tests on a model of one section of the package. This included drop testing using HSL's specifically designed 25 metre drop tower, and fire testing within a gas heated furnace to expose the package to temperatures in excess of 800 °C. Both sets of tests involved significant instrumentation of the package.

This first stage of testing allowed our Client to understand how the package was likely to behave prior to committing to the manufacture and testing of a full size prototype. After reviewing these test results, and concluding a design review assessment, full size prototypes were manufactured.

In compliance with International Atomic Energy Authority Regulations we undertook a number of 10 m drop tests on the prototypes using our purpose-built, 4-metre deep impact block. These tests represented a worst-case impact scenario for the container. In each test, the package was in a different drop orientation. We installed thirty transducers within the package to measure deceleration at critical locations. The tests were also recorded on high-speed video by our specialist, in-house photographic unit.

Outcome/Benefits

Using HSL's measured data, our Client was able to demonstrate that the damage from their predictions was a reliable indicator of what would actually happen to the package in different accident scenarios. The DfT were satisfied the integrity of the package was acceptable, and awarded the licence.

The heat transfer data collected during the fire tests was also applied by our Client to the development and validation of numerical models to aid the design of future, fire-resistant transportation packages.