Application of the Karagozian and Case material model to cemented wastes under accident conditions -ABSTRACT

In the UK, the Nuclear Decommissioning Authority is developing transport and operation systems for the movement of radioactive waste to a single repository site and emplacement underground. One of the criteria is that all wastes must be immobilised in a solid matrix. Two of the main encapsulants are Blast Furnace Slag / Ordinary Portland Cement (BFS/OPC) and Pulverised Fly Ash / Ordinary Portland Cement (PFA/OPC).

The behaviour of cement immobilised wasteforms have been modelled using material models developed for modelling soil, foam and concrete. The drawback of these older material models, was that they tend to be simplistic and do not model the complexity of the behaviour of cementitious systems realistically. As a result, for the same wasteform, adjustments need to be made to the input for different drop scenarios.

A new state-of-the-art material model for modelling concrete has recently been developed by Karagozian and Case Consulting Engineers. It differs from the other material models in that it models the behaviour of concrete very comprehensively. That is, with correct input, the behaviour can be modelled more robustly than any other existing material model. Both the input and the output are more defensible. There is therefore significant advantage in using this material model. However, before it can be used, it needs to be benchmarked against physical tests.

A comprehensive programme of work was undertaken to demonstrate the performance of the material model and to benchmark the model to material tests. The work consisted of six tasks:

Task 0 Feasibility Study

Task 1 Literature Survey

Task 2 Development of Methodology for deriving K&C material input parameters

Task 3 Design of the Test Programme

Task 4 Testing

Task 5 Calibration of the K&C material model

This paper presents a summary of the work.