ABSTRACT

The exothermic reaction associated with hydrating Portland Cement releases a significant amount of heat within concrete elements. These raised temperatures could give rise to thermal cracking which is a function of temperature differential and concrete stiffness.

In recent years computer-based modelling has become an intrinsic part of engineering. It has been employed to simulate the rise in temperature and distribution of heat within concrete elements. The prediction model developed in this project is based on the numerical finite element theory in combination with heat evolution curves obtained from adiabatic calorimetry. Predicted results are compared with two sets of measured data and comparisons are drawn. This model is also evaluated against the pre-existing finite difference numerical simulation (Ballim, 2004a). The finite element simulation provides engineers with temperature differentials from which generalised rules for cracking potential may be applied.

The implemented finite element model provides superior predictions to those of existing simulations and allows for future developments due to the advanced capabilities of the finite element theory.