Implementation of an Implicit Algorithm to obtain the concrete thermal parameters during the hydration process through the solution of the associated Inverse Problem.

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ABSTRACT

An implicit algorithm was developed and implemented to study the thermal behavior of fresh concrete by retro-analysis. Experimental data [1] obtained in previous activities from our research group was used to validate the algorithm. The experimental program comprised in the use of thermocouples located within the test bodies of seventy-five cubic centimeters sides, under semi-adiabatic conditions, and the temperature values generated during the hydration process were recorded in a period of twenty-eight days with a time interval of one hour. The obtained parameters [2] were later used for the analysis of samples. With the experimental data, and using the implemented algorithm, the heat generation curve associated with the chemical reactions occurring during the hydration process of the concrete, was obtained. Subsequently, by using the heat generation curve obtained for a specific concrete, simulations using the software ANSYS were performed for some concrete structures. The simulation results show a good approximation to the experimental data. In this study we concluded that the proposed implicit algorithm is an accurate, stable, and efficient method for the analysis of early-ages behavior of concrete structures.

Keywords:

Early age concrete behavior, thermal properties of concrete, inverse problem, finite element method

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