Simulation of thermal field in concrete hydrostructures with a water pipe

cooling system by the singular boundary method

* Yongxing Hong¹, † Wen Chen¹, Ji Lin¹ and Alexander H.-D. Cheng²

¹State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering, International Center for Simulation Software in Engineering and Sciences, College of Mechanics and Materials, Hohai University, Nanjing, 211100, China.

² School of Engineering, University of Mississippi, Mississippi 38677 USA.

*Presenting author: hongyxg@126.com †Corresponding author: chenwen@hhu.edu.cn

Abstract

The embedded water pipe system is often used as a standard technique for cooling heat to mitigate the crack induced by the thermo-stress during the concrete solidification. The prediction of the temperature distribution plays an essential role in the design of the structures and its cooling system. In this study, the singular boundary method, a semi-analytical meshless technique, is employed to analyze this troublesome problem. Compared with finite element method, numerical results indicate that the proposed scheme is accurate enough in the simulation of such complex problems.

Keywords: Thermal field; singular boundary method; semi-analytical scheme; water cooling pipe