

Thermal and structural analysis of RCC double-curvature arch dam

ABSTRACT

This paper focuses on the development, verification and application of a three-dimensional finite element code for coupled thermal and structural analysis of roller compacted concrete arch dams. The Karun III Arch dam located on Karun River, Iran, which was originally designed as a conventional concrete arch dam, has been taken for the purpose of verification of the finite element code. In this study, RCC technology has been ascertained as an alternative method to reduce the cost of the project and make it competitive. A numerical procedure to simulate the construction process of RCC arch dams is presented. It takes into account the more relevant features of the behavior of concrete such as hydration, ageing and creep. A viscoelastic model, including ageing effects and thermal dependent properties is adopted for the concrete. The different isothermal temperature influence on creep and elastic modulus is taken into account by the maturity concept. Crack index is used to assess the occurrence of crack and evaluate the level of safety of the dam. This study demonstrates that, high tensile stress concentration has been observed at the lower part and the abutment boundaries of the dam.

Keyword: RCC; Arch; Thermal stress; Creep; Mechanical behavior; Crack safety factor; Finite element method