Stress distributions in finite element analysis of concrete gravity dam

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Abstract

Gravity dams are solid structures built of mass concrete material; they maintain their stability against the design loads from the geometric shape, the mass, and the strength of the concrete. The model was meshed with an 8-node biquadratic plane strain quadrilateral (CPE8R) elements, using ABAQUS, a finite element analysis tool; giving a total number of 930 elements and 2929 nodes. Using the 2D Gravity Method, factors of safety against overturning and sliding, and shear friction factor are found to be 1.78, 1.10, and 3.78, respectively, which are greater than 1.5, 1.0, and 3.0, respectively. Also the stresses obtained were found to be less than the permissible values. Stresses distribution reveals maximum normal vertical stress of 2414 kN/m^2 (compression), 6.58 kN/m^2 (tension) and maximum shear stress values of 674.7 kN/m^2 (compression), 124.5 kN/m^2 (tension). These values are less than the permissible stress values. Also maximum vertical and horizontal crest displacements are 2.74 mm and 3.28 mm respectively.

Keywords: Gravity Dam, Meshing, Finite Element, Stresses and Strains

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