Simulation of flow from under the Diversion Dam and cut-off wall effects with finite volume method

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Abstract

Including measures to prevent the piping phenomena, reduction the outflow gradient and the leaking flow rate of sub-hydraulic structures is construction of cut-off walls dam. Therefore, this study was conducted to investigate the effect of cut-off wall on pressure gradient and uplift force, a computer model has been developed that the general equation for water flow in saturated homogeneous soil, due to the location of the cut-off walls dam in upstream (heel), downstream (toe) and middle Diversion Dam with identical conditions, has been solved using the finite volume approach. outcomes includes of Contour lines potential, Uplift force vector and calculation outlet flow quantity. This result confirmed that the cut-off wall closer to toe, the outlet flow quantity and uplift force will be smaller.

Key words: Contour lines potential, flow lines, drifted power, finite volume method

1. Introduction

Permeability and seepage in foundation and support of dams' analysis is most important phase identification for the implementation of individual projects. Numerical analysis method and then using analytical software for major construction projects, has long prevailed. However, the use of this method in analyzing permeability of the rock mass permeability, has not long history. In 1992, Hassler, L., et al. [6] analysis joint permeability and injectivity numerically. In the same year, Eriksson, M., et al and in 2000, and Lee, JS and subsequent research accomplished about concerning the use of numerical analysis permeability and seepage analysis of rock mass. Continuity equation (1) in homogeneous soils indicate two sets of orthogonal curves, i.e., flow lines and potential lines. Line is the linear flow of moving water into the soil particles from upstream to downstream along the permeable. The line is a linear potential is the same at all points along the potential times. Thus, if placed at various potential points along a line of Piezometers, all the same height is above the water level. The combination of flow lines and potential lines is called flow network. To draw the network and potential should be drawn as:

1. The flow lines cut potential lines with right angle.
2. Composed elements are almost square.

The potential created under the follow-on, create uplift force [6]. One of the most destructive forces that will act toward instability diversion dams is drifted that power has drifted due to water flow in porous media diversion dams. The shear force between Diversion Dam and its foundation, causing tensile strength decreases and eventually led to the diversion dam sliding and overturning it. The most important criteria for the design of the output gradient is reliability of piping. Including measures that is used, causes reduction drifted power and gradient reductionism dam wall. Impermeable cut-off wall that often are vulnerable to very low or low and slow water movement, and hence the pressure on water structure prevent by water under the structure [6], Sedghi Asl and et al, [3] evaluated the effect of reducing leakage in upright position and velocity optimal sealing membrane under hydraulic structures using numerical models and found that the best place for spill control and below washing is Heel Diversion Dam. Abolpor [1] proposed a model that drifted against hydraulic structures with several different methods used to calculate the amount calculated piping methods and Bella Lynn and Khosla, and the calculated leakage Khosla method and the