World Academy of Science, Engineering and Technology
International Journal of Geotechnical and Geological Engineering
Vol:9, No:12, 2015

Numerical Study on the Cavity-Induced Piping Failure of Embankment

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Abstract : Cavities are frequently found beneath conduits on pile foundations in old embankments. Cavity reduces seepage length significantly and consequently causes piping failure of embankments. Case studies of embankment failures indicate that the relative settlement between ground and pile supported-concrete conduit was the main reason of the cavity. In this paper, an attempt to simulate the cavity-induced piping failure mechanism was made using finite element numerical method. Piping potential is examined by carrying out parametric study for influencing factors such as cavity length, water level, and flow conditions. The concentration of hydraulic gradient adjacent to cavity was found. It is found that the hydraulic gradient close to the cavity exceeds considerably the critical hydraulic gradient causing piping. Piping failure potential due to the existence of cavity is evaluated and contour map for the potential risk of an embankment for piping failure is proposed.

Keywords : cavity, hydraulic gradient, levee, piping
Conference Title : ICGEG 2015 : International Conference on Geotechnical Engineering and Geomechanics
Conference Location : Sydney, Australia
Conference Dates : December 10-11, 2015

Open Science Index, Geotechnical and Geological Engineering Vol:9, No:12, 2015 publications.waset.org/abstracts/33770.pdf