

ABSTRACT

THE EFFECTS OF PIPING ON THE SHEAR STRENGTH OF SOILS

Levees and earth dams are important infrastructure and their failure can have catastrophic consequences. To avoid such instances and protect public safety an understanding of the factors that affect levees and earth dams is needed.

This research focuses on the effects of internal erosion on the shear strength of soils. Many researchers have identified concentrated leaks in the form of “pipes” as the most threatening to embankment stability. Concentrated leaks in levees and earth dams can be caused by hydraulic cracking, differential settlement, tree roots, and even animal burrows. The hypothesis that internal erosion loosens the soil structure and reduces the soil’s shear strength is investigated.

Concentrated leaks are simulated in cohesive and non-cohesive soil specimens. The two soil types are selected to encompass the soils commonly used in levee and earth dam construction. The field stress conditions for a consolidated embankment subjected to a quick hydraulic load are simulated on the soil specimens by using a triaxial apparatus.

The second part of this study deals with the understudied aspect of peat erosion. A fibrous non-cohesive peat and a fine grained cohesive peat are used to investigate the erosion characteristics of peat soils.

The results quantitatively indicate that 1) piping in all soil types reduces the shear strength of the soil. 2) A “pipe” in the vertical orientation affects the shear strength of the soil more than a “pipe” in the horizontal or inclined orientation. 3) Peat soils do not erode under typical in situ hydraulic gradients.

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