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Seepage induced retrogressive failure of a reservoir slope

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ABSTRACT

Reservoir rim slopes often experience seepage induced slope instability during rainfall season. The predominant phenomenon observed during monsoons is the establishment of continuous seeping condition either steady or unsteady in nature that may induce instability. This paper presents some preliminary results from a study conducted to investigate the failure mechanism of a cohesionless soil slope under steady state seepage condition. A small scale slope model was developed. Uniformly graded fine sand (d_{50} = 630 μ) was used to form the slope. The selected slope height was 24.5 cm and inclination angle was 30°. The slope was subjected to a constant water head on either side near toe of the slope to create a steady-state condition. Water was allowed to seep through the slope mass. The slope failure initiated with the formation of a sink hole near toe with progression of time. Sink hole refers to the possibility of backward erosion. With test progression, tension crack developed at surface and became wider resulting in rotational block slide. The failure started near toe and progressed backward with larger block slides causing retrogressive slide (Fig. 1). The piezometer observations are verified numerically using a finite element groundwater seepage analysis in Slide 2D. This preliminary study suggests the need of increased focus towards designing effective and economical measures, not only the initiation of the instability but the post initial instability failure mode variation with time progression should also be given due importance.

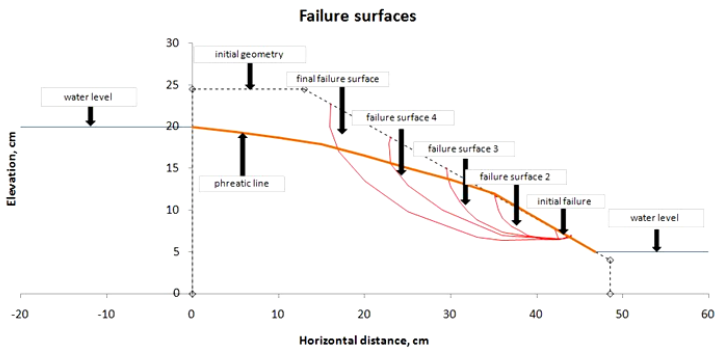

Fig. 1 Failure surfaces depicting failure type: retrogressive multiple rotational slide

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