PERFORMANCE OF GEOSYNTHETIC REINFORCED SLOPES AT FAILURE

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Abstract: A centrifuge testing program was undertaken to investigate the failure mechanisms of geosynthetic reinforced soil slopes and to evaluate the assumptions in their design. Scaling laws were established so that factors of safety in the models would be identical to those in prototype structures. Failure of the models was characterized by well-defined shear surfaces through the toe of the slopes, which is in good agreement with current design methods for reinforced slopes based on limit equilibrium. The moment of failure was defined by a sudden change in the rate of settlements at the crest of the slope. In contrast to the assumption in current design procedures that failure should initiate at the toe of a reinforced slope, failure initiated at midheight of the slopes. Model deformations were found to depend on the backfill properties, but were essentially independent of the tensile strength and spacing of the reinforcements. The test results showed that overlapping reinforcement layers contribute to stability as they failed by breakage instead of by pullout when intersected by the failure surfaces. The experimental results also indicate that stability of the reinforced slopes is governed by the peak shear strength and not by the critical state shear strength of the backfill soil. A new distribution of maximum reinforcement forces with depth, which is consistent with the failure mechanism observed in the models, is proposed for geosynthetic reinforced soil slopes.

Full reference:

Link to file*:

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*File may be downloaded for a fee from ASCE Library