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The mechanism and geotechnical properties of soils associated with dangerous mass movements

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The mechanism of flow slides and the dominant geotechnical factors influencing their occurrence are investigated by means of a newly-developed ring shear apparatus. Drained and undrained tests were carried out on fully saturated soils having different uniformity coefficients. Soils constituted to various uniformity coefficients were classified as well graded (WG), intermediately graded (ING), narrowly graded (NAG) and gap graded (GAG) and tested under a wide range of laboratory conditions. Samples from a landslide site were used to verify some results of the investigation. It was revealed that although steady state strengths were significantly affected by grading, the friction angles at steady state were not. Similarly, it was found that the friction angles at phase transformation, threshold state, and steady state were the same and independent of grading. The influence of grading on shear strength was obvious in all states but was especially pronounced in medium to dense states. Peak shear strengths were in the order of WG> ING> NAG> GAG whereas steady state strengths were ranked as NAG> ING>WG>GAG. In loose state, the steady state strengths of well graded, intermediately graded and narrowly graded specimens were found to be very low. However, only the narrowly graded and intermediately graded specimens have steady state strengths of zero; no well graded specimen in loose state suffered complete liquefaction. On conditions triggering liquefaction and flow, the research found that there was a critical pore water pressure above which sudden collapse and liquefaction occurred and below which soil deposits dilated and gained some measure of strength. Compared to the effect of grading, void ratio, rate of loading, and confining stress, exceeding the critical pore pressure appeared to be a bigger factor determining whether or not a soil flow-liquefied.