

**RING SHEAR TEST ON UNSATURATED SOIL. EFFECT OF FAST SHEARING RATE ON RESIDUAL STRENGTH**

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**ABSTRACT**

Residual shear strength of slip-surface soils is an important issue for investigating landslide mechanisms and evaluating the potential reactivation (Skempton, 1985). So far, many researchers focused on the residual shear strength and found that it can be influenced by a wide range of factors. They can be classified as intrinsic factors that depend on physical properties of the soil, (i.e. plasticity, granulometry, mineralogy, viscosity, among others (Kenney, 1967; Tiwari and Marui, 2005; Nakamura et al., 2010)), or as external factors such as normal stress, changes in pore pressure, temperature or changes in landslide velocity, (Skempton, 1985; Stark and Eid, 1994; Tika et al., 1996, Corominas et al., 2005).

In particular, creeping motion of landslides on clayey soils that exhibit slow or moderately slow velocities can be associated to the dependence of residual resistance with strain rate. Several authors have been address the strain rate effects on the residual strength at laboratory level (Skempton, 1985; Lemo et al. 1985; Tika et al. 1996; Hu et al, 2017; Lian et al, 2018). They state that this mechanism provides a reasonable explanation to the resistance fluctuation that exhibit by certain creeping landslides. The increase of the available strength along sliding surface can be able to maintain the landslide at constant velocity.

This article analyzes the shear rate dependency of residual strength of three different clayey soils by means of annular shearing tests carried out in the Bromhead 1979 equipment (Bromhead E. N., 1979). The materials were prepared in unsaturated conditions at hygroscopic moisture and compacted under a normal tension of 10 MPa. During shearing stage, a slow shearing speed equivalent to 0.089 mm/min was imposed with the aim of reaching residual resistance. Subsequently, shearing speed increments were applied until reaching 45 mm/min with rest stages before applying velocity increments. Despite of the complexity in the interpretation of the results due to the sinuosity of the measured shear strength during the test, a general positive effect has been evidenced in comparison with the residual resistance obtained under slow shearing stage. Details of the analyzed soils, test modality, interpretation of results and other aspects are described in the paper.

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