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Experimental Investigation on the Shear Strength Parameters of Sand-Slag Mixtures

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Abstract : Utilizing waste materials in civil engineering applications has a positive influence on the environment by reducing carbon dioxide emissions and issues associated with waste disposal. Granulated blast furnace slag (GBFS) is a by-product of the iron and steel industry, with millions of tons of slag being annually produced worldwide. Slag has been widely used in structural engineering and for stabilizing clay soils; however, studies on the effect of slag on sandy soils are scarce. This article investigates the effect of slag content on shear strength parameters through direct shear tests and unconsolidated undrained triaxial tests on mixtures of Perth sand and slag. For this purpose, sand-slag mixtures, with slag contents of 2%, 4%, and 6% by weight of samples, were tested with direct shear tests under three normal stress values, namely 100 kPa, 150 kPa, and 200 kPa. Unconsolidated undrained triaxial tests were performed under a single confining pressure of 100 kPa and relative density of 80%. The internal friction angles and shear stresses of the mixtures were determined via the direct shear tests, demonstrating that shear stresses increased with increasing normal stress and the internal friction angles and cohesion increased with increasing slag. There were no significant differences in shear stresses parameters when slag content rose from 4% to 6%. The unconsolidated undrained triaxial tests demonstrated that shear strength increased with increasing slag content.

Keywords : direct shear, shear strength, slag, UU test
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