Influence of volumetric and shear strains on the destructuration of saprolitic soils

Based on a review of numerical models it would appear that debate is still open as to which combination of volumetric and shear strains is responsible for destructuration of intact soils. Direct experimental evidence is rather limited and mostly related to sedimentary clays. A saprolitic soil from Hong Kong that had been block sampled was tested to investigate the effects of sample disturbance and more in general of destructuration. The amount of destructuration was quantified by measuring the elastic shear stiffness by means of bender elements mounted axially in triaxial cells. The tests were designed to investigate separately the effects of volumetric and shear strains, by way of loading cycles reaching increasingly larger strains. The loading cycles were carried out under isotropic conditions and at constant mean effective stress for the volumetric and shear strains, respectively. In addition, the results obtained were compared with those from a test on a reconstituted specimen that was carried out in a similar fashion. In general, a reduction in shear stiffness was observed for the intact specimens, while a slight increase was measured for the reconstituted specimen at the same strain levels. The same held true also after normalising for void ratio, which was necessary as this changed as a result of straining hence having an effect on the shear stiffness. The reduction in stiffness observed for the intact specimens, which indicates loss of structure, was observed for both test types. However, at a given strain threshold, the reduction was larger for the specimen that underwent cycles of volumetric strains.

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