

The Influence of the Form of Grain on the Mechanical Behaviour of Sand

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Abstract : The size and shape of soil particles reflect the formation history of the grains. In turn, the macro scale behavior of the soil mass results from particle level interactions which are affected by particle shape. Sphericity, roundness and smoothness characterize different scales associated to particle shape. New experimental data and data from previously published studies are gathered into two databases to explore the effects of particle shape on packing as well as small and large-strain properties of sandy soils. Data analysis shows that increased particle irregularity (angularity and/or eccentricity) leads to: an increase in e_{max} and e_{min} , a decrease in stiffness yet with increased sensitivity to the state of stress, an increase in compressibility under zero-lateral strain loading, and an increase in critical state friction angle ϕ_{cs} and intercept Γ with a weak effect on slope λ . Therefore, particle shape emerges as a significant soil index property that needs to be properly characterized and documented, particularly in clean sands and gravels. The systematic assessment of particle shape will lead to a better understanding of sand behavior.

Keywords : angularity, eccentricity, shape particle, behavior of soil

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