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SHAPE CHARACTERIZATION OF COARSE PARTICULATES AIDED BY FOCUS VARIATION MICROSCOPY

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ABSTRACT

Particle shape affects both the mechanical behaviour and packing density of soil and is thus a parameter of interest in geotechnical engineering. Shape is defined by three independent parameters: form, angularity, and roughness. This work explored the characterization of form and angularity of sand-sized specimens of different origins and shapes. The quantification of form requires the measurement of the smallest (S), intermediate (I) and largest (L) dimensions of a particle. Two of these dimensions can be readily assessed along a particle's two-dimensional outline, for example, with the aid of a microscope. Determining the third dimension, which is typically S, presents difficulties in sands. Despite advancements in modern technology, there is a lack of a simple and inexpensive method for measuring the three-dimensional form of sand.

The current work examined the efficacy of focus variation microscopy for the indirect measurement of particle height from a two-dimensional projection. Focus variation was commensurate with the measurement of particle height from a lateral projection; proving to be a relatively simple and accurate method that facilitates the quantification of form in sands.

Furthermore, particle angularity, defined by a descriptor termed 'ellipseness', was evaluated along three-orthogonal views to assess its variability. In sub-rounded and rounded particles, ellipseness in plan view was reasonably representative of the particle's mean lateral ellipseness. This descriptor adequately distinguished between rounded and angular particles, but not between particles of intermediate degrees of roundness.