



Rethinking Site Characterization in Tropical Residual Soil Profiles

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ABSTRACT

Residual soils are generally known to be heterogeneous compared to transported soils. However, despite the recognition of their heterogeneity, the fact does not seem to receive adequate attention within general geotechnical engineering practice of site characterization in residual soil profiles. This communication investigates the need for rethinking site characterization to accommodate heterogeneity of these soils based on a study carried out at two sites located in the Galle district of southern Sri Lanka. The study collected bulk and relatively undisturbed soil samples; a conventional set of soil index testing were then conducted with the use of ‘representative’ samples as a part of a higher order testing series for strength-deformation behaviour of the soils; the index testing included particle size distribution analysis, Atterberg limits tests, specific gravity tests, and determination of in-situ dry unit weight. Upon observation of strength-deformation behaviour with direct-shear testing, a secondary set of index testing was carried out with the constituents of each specimen that underwent direct-shear testing. These sets of tests recognized significant deviation from the ‘representative’ sampling-based characterization. For soils from one of the sites, the overall classification changed from Silty Sand (SM) to Sandy Elastic Silt (MH) as per Unified Soil Classification System (USCS) and the fines content reported by individual direct-shear specimens were 26% more on average with respect to the bulk sampling-based classification. Locating the specimens on intergranular/interfine matrix phase diagram highlighted the differences in grain-scale load transfer mechanisms that apparently varied from (1) coarse-dominated with little or no contribution of fines through (2) some contribution of fines to (3) significant contribution of fines with fines acting as separators between coarse grains for the soils from the other site. Therefore, this communication concludes that deviation from general practice of site characterization is needed to accommodate the heterogeneity of tropical residual soils. Particularly, when site characterization is performed to facilitate designs involving use of soil material at in-situ state an indexing process similar to that used in this study may be used; also relatively undisturbed samples may be used whenever possible to make visual observations on in-situ state of particle packing.

Keywords: *Site characterization, Soil behaviour, Soil index properties, Tropical residual soils*