

Thermal Conductivities of Some Common Soils in Trinidad

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ABSTRACT

Thermal conductivity (k) of twelve soils from Trinidad was measured in the field and the laboratory using a portable sensor and probe. The effect on k of compacting three of the soils (a sandy loam, clay loam and clay) using 5, 15 and 25 Proctor hammer blows at water contents which ranged from 5% to 40% was further investigated in the laboratory. Bulk density (ρ_b) achieved during soil compaction was measured to assist in the interpretation of the results. The k measured in the field ranged from 0.90 to 1.55 W m⁻¹ °C⁻¹ and was within 0.1 W m⁻¹ °C⁻¹ of the corresponding laboratory-measured values for the individual soils. The k of the laboratory-compacted soils, which ranged from 0.5 to 2.00 W m⁻¹ °C⁻¹, increased with increasing water contents with maximum ρ_b being reached before the maximum k . The clay soil had lower values of k and ρ_b than the clay loam and the sandy loam soil. Good agreement was found between the field and laboratory measured k as well as the k values predicted using the Campbell model. The results obtained are discussed in relation to pipe laying in Trinidad. Apart from soils with appreciable sand contents, most soils because of their large clay contents would require standard backfills during cable laying.

Keywords: Thermal, conductivity, soil, compaction, cable, density.