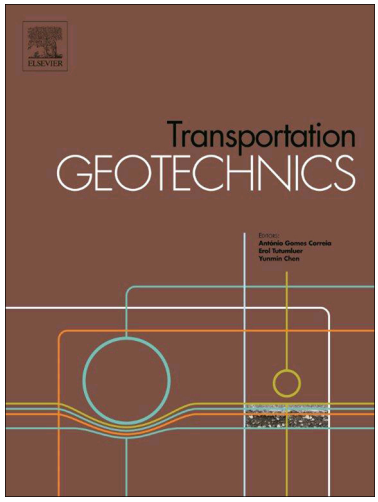

Consideration of the deterioration of stabilised subgrade soils in analytical road pavement design

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ABSTRACT

The stabilisation of road subgrade soil may improve its mechanical properties considerably, however under the combined effect of cumulative traffic load and weathering these materials deteriorate over time and lose performance. However, current road design procedures neglect such deterioration of stabilised soils and consequently their use may result in the under-design of road pavements and as a result unplanned maintenance and /or premature road failure. To address this, this research presents the results of a research programme marrying experimental, analytical and numerical work which was used to develop a methodology which can be used for the first time to design accurately road pavements incorporating stabilised subgrade soils. An extensive experimental programme was carried out consisting of laboratory durability tests to determine the mechanical behaviour of stabilised subgrade soils, in terms of resilient modulus and permanent deformation, under cycles of wetting and drying. Results of the durability tests were used to validate an analytical predictive equation which considers the changes that take place to the material after cycles of wetting and drying. The experimental results show a decrease in the resilient modulus after 25 cycles of wetting and drying cycles for three types of fine grained subgrade soils stabilised with varying amounts of lime-cement. In order to adequately replicate the stress dependency of the performance of the stabilised subgrades for analytical pavement design, two equations were developed that relate the resilient modulus of a stabilised soil with unconfined compressive strength (UCS). The developed equations were utilised with a numerical finite element model of a road pavement to determine the most appropriate road pavement designs, on an engineering basis, for a variety of stabilised soils.

Keywords: Deterioration, Stabilisation, Subgrade Soils, Analytical Pavement Design