Moisture-dependent resilient modulus of chemically treated subgrade soil

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ABSTRACT

Traffic loads induce cyclic loading under influence of environmental factors, and is affected by the variation of moisture content and suction (s). These parameters are difficult to quantify, and the methods for determination are cumbersome. This paper presents extensive experimental studies used to obtain the resilient modulus-suction (MR-s) relationship of the treated subgrade soil. An optimum design of bentonite-magnesium-alkalinization (BMA) was used an additive. The cyclic Triaxial frame with ELDYN system was employed to measure MR values and the suction was estimated using the filter paper test. A bimodal soil water characteristic curve (SWCC) was observed for treated soil with unheated BMA additive and pre-treatment at heated (BMAH) conditions due to the presence of cementitious products. The MR-s relationship was also developed for the stabilized soil using a normalized model. Results showed that the BMAH samples had a significant level of improvement of MR at higher suction levels as compared to BMA samples but this behaviour of BMAH didn't sustain under fully saturated condition. The change in moisture contents under seasonal variation affects the subgrade performance. This study shows the soil additive can effectively improve the mechanical properties of the soil under various moisture contents. The MR for the treated soil can be estimated using the normalized model under the worst-case scenario of a subgrade when the soil is at a fully saturated condition.

KEYWORDS: Silty sand, Magnesium chloride, Alkaline activator, Resilient modulus, SWCC, Subgrade

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