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Chemical Modification of Uniform Soils and Soils with High/Low Plasticity Index

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ABSTRACT

Lime and/or cement are used to treat weak subgrade soils during construction of highways. These chemicals are mixed with the soil to improve its workability, compactability and engineering properties. INDOT (Indiana Department of Transportation) has been using chemical modification of native soils for the past 20 years. In fact, 90% of current subgrade is treated, typically with quick lime, lime byproducts or cement. For pavement design, it is customary to not include any improvement of the subgrade for the design of the pavement layers. Recent research completed through JTRP (Joint Transportation Research Program) recommends a higher stiffness modulus for chemically modified soils, which has resulted in a significant reduction in pavement thickness and cost. Despite the large experience accumulated with chemical soil modification, there are no guidelines to treat the following soils, which are relatively common in Indiana: Low plasticity clays ($PI < 10$); High plasticity clays ($PI \geq 25$, density < 95 pcf); and Dune sand, sugar sand and other uniform soils. Current knowledge does not provide information about stabilization of these soils. The primary objective of the research is to explore combinations of lime and lime by products with cement to treat the soils. A comprehensive laboratory testing program has been completed to classify the native soils that will be used for treatment. The tests include Atterberg Limits, Proctor and Sieve Analysis. A preliminary investigation, based on an extensive literature review, shows that the three soils considered in the research can be successfully treated with percentages of lime ranging between 4% and 8%. Laboratory tests are on-going to ascertain the optimum chemical dosage and the increase of strength of the treated soils with time.

KEYWORDS

Plasticity Index, soil modification, lime and cement treated soil, highway subgrade soil