A Model to Predict Resilient Modulus of Lime-Fly Ash Stabilized Soils

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ABSTRACT

An empirical model, developed originally by The Ohio State University for The Ohio Department of Transportation to predict the resilient modulus (M_r) of conventional cohesive subgrade soils, is evaluated for its suitability to predict M_r of lime- fly ash (LFA) stabilized soils. Resilient modulus is a key parameter used in the AASHTO design of flexible pavements. The resilient modulus varies with seasonal moisture variations and hence an M_r predictive tool must account for the effect of soil moisture content.

The M_r model studied in this paper includes as inputs optimum moisture content, field moisture content, field dry density, liquid limit, plasticity index, specific gravity, percent finer than #200 sieve (0.075 mm), and unconfined compressive strength, as well as the soil stress state (confining stress, and deviator stress).

A laboratory investigation was carried out to evaluate the performance of the model in predicting M_r of LFA stabilized soils. Three cohesive soils types (A-4, A-6, and A-7-6) were stabilized in the laboratory with varying amounts of lime (up to 5%) and Class F fly ash (up to 15%). A total of three control and six LFA mixes were tested. The control and LFA stabilized samples were compacted at optimum moisture content then tested in the laboratory after 7 days of curing. The model was used to predict the resilient modulli of the samples. Extensive laboratory testing was carried out to measure the resilient modulus of the samples at the same curing duration.

The predicted M_r values for the LFA stabilized soils were compared with experimental observations. The model predictions of M_r agreed very well with the measured values (within -13% to +30%). In order to study the effect of moisture content on M_r of control and stabilized soils and characterize the degradation of M_r due to moisture increase in natural and LFA soils, the model input moisture content was varied up to saturation.

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