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ENHANCEMENT OF RESILIENT MODULUS DATA FOR THE DESIGN OF PAVEMENT STRUCTURES IN FLORIDA

PROBLEM STATEMENT

The subgrade resilient modulus (M_R) is an essential engineering parameter for the mechanistic-empirical pavement design. A long-term implementation program is in effect to measure the resilient modulus in a laboratory for the design of pavement structures in Florida. Several major research projects have been conducted in the past ten years to study the M_R characteristics of Florida pavement soils. However, measuring the resilient modulus of a pavement material is a complex and difficult task. The resilient modulus test procedure and the selection of an appropriate design M_R value for pavement materials have always been significantly complicated by the fact that the resilient modulus is affected by many factors: soil type, test method, specimen moisture and density, specimen size, confining pressure, deviator stress, and so forth. One soil specimen may have many different resilient modulus values depending on the states of stresses. In view of the complexity and difficulty in conducting the resilient modulus measurement, researchers developed a database program to catalog available resilient modulus test results.

OBJECTIVES

This study is a follow-up to *Implementing Resilient Modulus Test for Design of Pavement Structures in Florida* (BC352-06), which resulted in the development of a resilient modulus database for pavement design applications. The primary objective of the present study was to populate and enhance the previously developed resilient modulus database with additional resilient modulus test results for the purpose of establishing resilient modulus correlation models based on basic material physical properties.

FINDINGS AND CONCLUSIONS

Researchers selected 25 suitable subgrade materials for testing, in cooperation with Florida Department of Transportation (FDOT) district offices around the state. They then characterized the basic physical properties of the subgrade materials and measured the resilient modulus using the AASHTO T307-99 test method. All of the test data concerning the basic material physical properties and the resilient modulus test results were stored in an enhanced Microsoft Access database. In addition, a comprehensive literature review was conducted to evaluate the resilient modulus of granular subgrade materials.

The resilient modulus test results were analyzed using a statistical approach (Minitab statistical software) to evaluate the effect of soil physical properties on the resilient modulus. Multiple regression analyses were also performed to find optimum resilient modulus prediction models based on the various soil types, test methods, and other test conditions. The resilient modulus values obtained from the prediction models were generally within a range of +/- 20% of the laboratory measured resilient modulus values.

BENEFITS

The research findings from this study could be adopted for future implementation of the mechanistic-empirical pavement design in Florida. The developed resilient modulus database would provide pavement designers with an easy access to all available resilient modulus test results of the Florida subgrade materials. Generally, the resilient modulus database and correlation models could be very useful for data management and pavement design. Pavement design is tied to the resilient modulus of the subgrade, which means that any process that results in the use of subgrades with better performed resilient modulus will improve the performance of the pavement. Improved pavement performance means less maintenance and reduced interruptions to the traveling public, and cost savings.

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