Florida Department of Transportation Research

Development of Correction Factors between Lab and Field Modulus

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New roadway designs or rehabilitations require engineers to consider the many factors of pavement longevity. The 1993 AASHTO Design Guide informs them in this complex task. First developed in the 1960s through research on Illinois test tracks, the guide relied on 1960s construction methods, traffic volumes, and vehicle types. Extensive aids allowed fairly accurate application of the guide, but as demands on roads increasingly exceeded the guide's basis, it became less reliable in producing acceptable pavement designs.

In 2002, AASHTO published an update, the Mechanistic-Empirical Pavement Design Guide (M-E PDG). It accounts for current conditions and also contains methods for testing roads and deriving the location-specific factors its design equations require, offering a chance to predict pavement performance more reliably. To use this approach, one must know how design inputs derived from in situ tests compare to those determined in the laboratory.

Among the many M-E PDG inputs, this study focused on the resilient moduli of pavement layers. The study aimed (a) to recommend correction factors for determining lab-equivalent moduli, given corresponding base, stabilized subgrade, and embankment moduli from in situ pavement testing, and (b) to evaluate results from nondestructive tests and recommend a procedure for characterizing existing pavement condition for flexible pavement overlay design based on the M-E PDG.

This project extends two similar FDOT-funded studies with more comprehensive analysis of field and lab test data. Field sections from the previous projects were revisited so that their information could be used, and extensive, additional field and laboratory tests were conducted to collect data needed to determine resilient moduli of pavement layers in several Florida settings and soil types.

Field tests for determining in situ resilient modulus included falling weight deflectometer (FWD), portable seismic pavement analyzer (PSPA), and dynamic cone penetrometer (DCP). Conducting tests close together in time and space assured similar conditions for data collection. During tests, depth to water table and moisture content of the asphalt and underlying materials were measured.

FWD (trailer) and PSPA (bottom left) data were collected both along and between the wheel paths at six positions along this stretch of a North Florida highway.

Dynamic modulus master curves were derived from lab tests of asphalt concrete cores and binder or, when the required sample size demanded it, from properties of the extracted binder and volumetric properties of asphalt concrete. Resilient moduli of underlying materials were mostly available from the previous projects. However, additional soil suction tests were necessary to determine the variation of modulus due to moisture content.

This report presents correction factors relating field- and laboratory-determined resilient moduli of selected pavement layers. The affect of variations in correction factors on the M-E PDG design process is also considered.

FDOT Contact: Charles Holzschuler, FDOT Materials Office
Principal Investigator: Jeong Ho Oh, Texas Transportation Institute
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