Research Project

02-3B

Capsule

Technology Transfer Program

LTRC

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Comparison of the In-Situ Strength and Laboratory Mechanistic Properties of Asphalt Concrete Mixtures

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LTRC

Louisiana Transportation Research Center

Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

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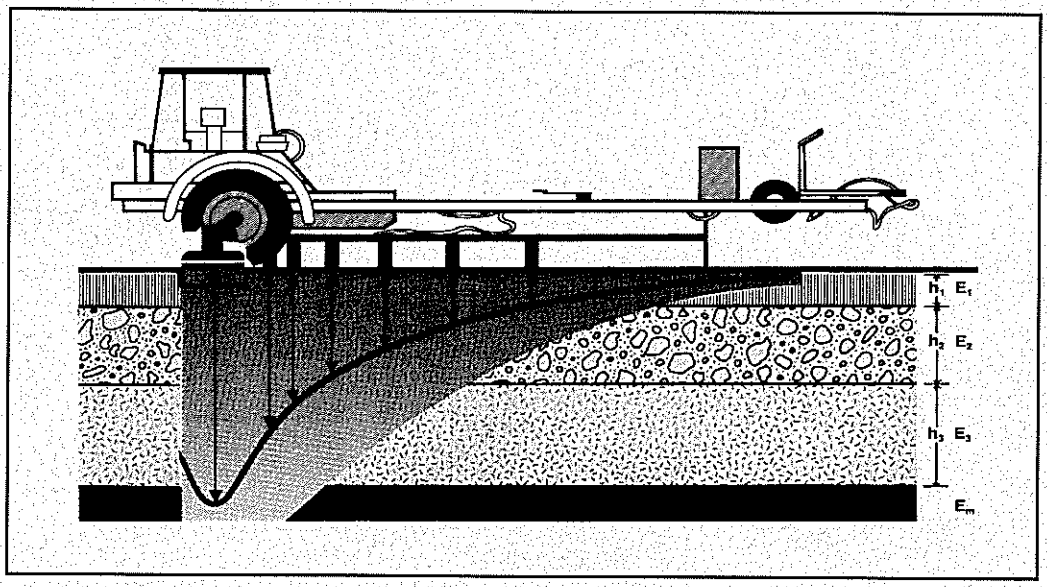
Problem

The acceptance of asphalt concrete pavements is often based on laboratory and field measurements of density, along with field measurements of smoothness. However, this approach does not guarantee acceptable pavement performance during its design life. Recognizing this concern, the 2002 AASHTO structural pavement design methodology stipulates modulus, or stiffness, as a design parameter.

Current methods of measuring pavement density for quality control and assurance are considered laborious and destructive. Field cores are taken at several locations, and air voids tests are performed in the laboratory. An alternative method for measuring in-place field density involves a nuclear-based test device, but this device tends to have problems associated with equipment handling/storage and accuracy of measurement.

Research is needed to develop a methodology to measure the modulus of asphalt concrete mixtures from non-nuclear in-situ test devices.



Falling Weight Deflectometer

Objective

The major objective of this project is to develop estimation models for asphalt pavement modulus, or stiffness, values from in-situ test measurements. A secondary objective is the evaluation of non-nuclear devices for measurement of in-situ pavement properties.

Description

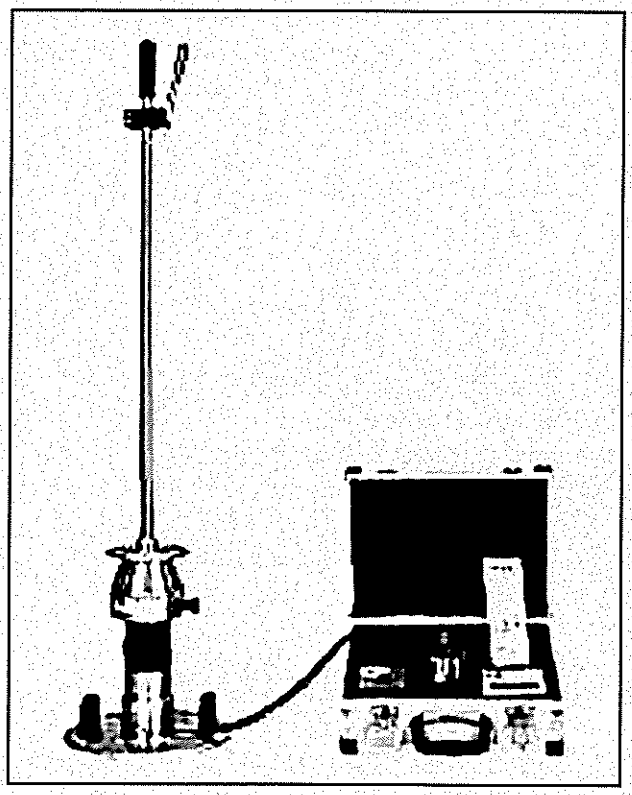
To achieve the objectives of this study, several rehabilitation projects throughout Louisiana will be selected, based on known traffic data and good plant records of asphalt concrete mixture consistency. Several laboratory and field tests will be conducted on samples from the selected projects.

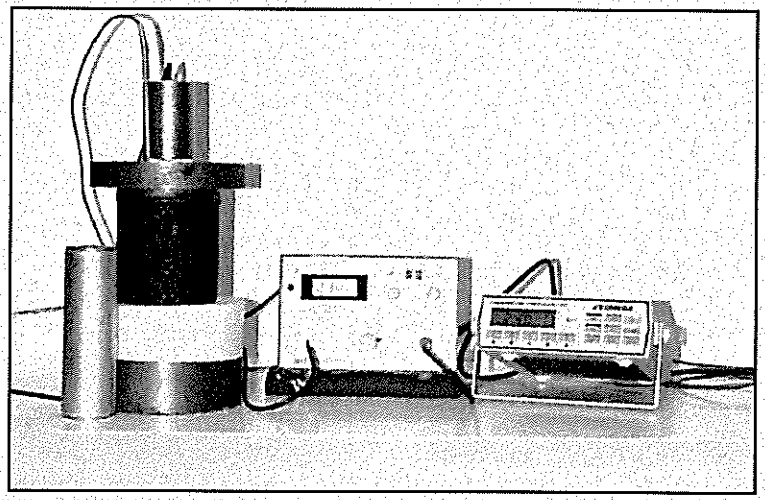
The density of roadway cores will be measured in the laboratory using conventional (SSD) and vacuum sealing (CoreLok) methods. In-situ roadway density will be measured in the field using a non-destructive field device, known as the Pavement Quality Indicator device. Other non-destructive tests will be performed at the selected roadways using the Falling Weight Deflectometer (FWD), the Portable Light Falling Weight Deflectometer (LFWD), and the Portable Seismic Pavement Analyzer (PSPA).

Data obtained from the aforementioned non-destructive tests will be used to calculate a modulus, or stiffness, value for the various pavement layers and roadbed soil. Additionally, laboratory-compacted samples and field cores will be tested for dynamic shear modulus and indirect tensile resilient modulus. Comparison of the calculated modulus values and the laboratory-measured modulus values will facilitate the development of a modulus prediction model.

Implementation

The results of this research project will lead to the development of a model for estimating the modulus/stiffness of asphalt concrete pavements based on data obtained from non-destructive in-situ tests. This type of model will complement the current volumetric analysis procedures with a separate strength parameter for quality control and assurance.





Above: Portable Seismic Pavement Analyzer

Left: Light Falling Weight Deflectometer