Research Project

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C a p s u l e

Technology Transfer Program

LTRC

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Comparative Evaluation of Subgrade Resilient Modulus from Non-destructive, In-situ, and Laboratory Methods

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Principal Investigator:
Kevin J. Gaspard, P.E.
Pavement Research Manager
LTRC

Co-Principal Investigator:
Dr. Louay N. Mohammad
Associate Professor
LTRC

LTRC Contacts

Administrative:
Harold "Skip" Paul, P.E.
Assoc. Director, Research
(225) 767-9102

Technical:
Mark Morvant, P.E.
Pavement & Geotechnical
Research Administrator
(225) 767-9124

LTRC

Louisiana Transportation Research Center

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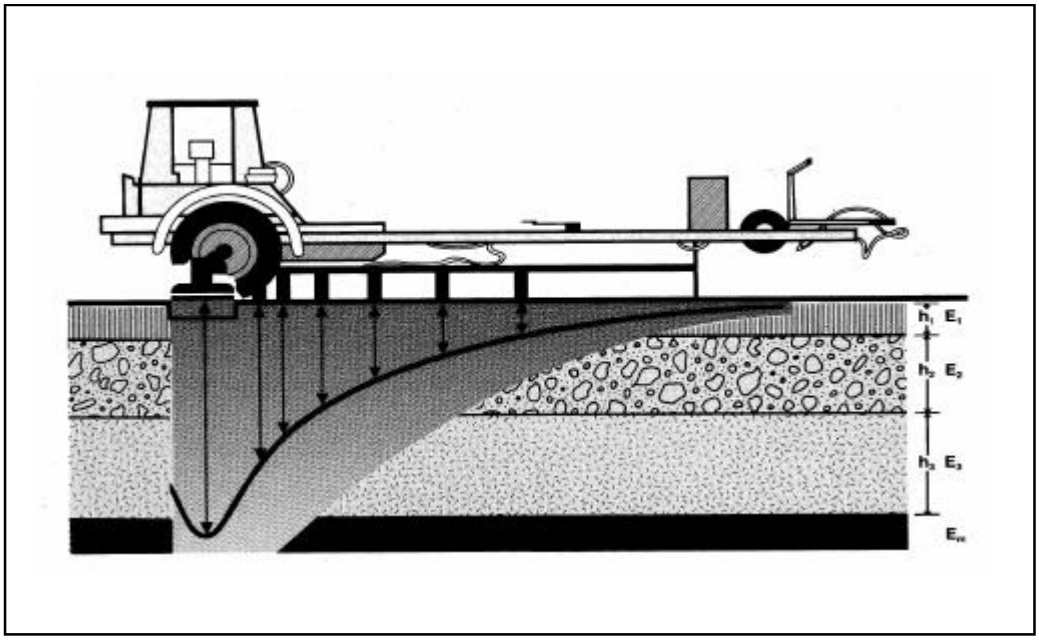
4101 Gourrier Avenue
Baton Rouge, LA 70808-4443

Problem

The AASHTO guide for design of pavement structures recommends using resilient modulus (M_r) to characterize base and subgrade soils when designing flexible pavements. Furthermore, the design guide requires cataloging the M_r values for commonly used soil types to attain optimum reliability of the design procedure.

Currently, LADOTD estimates the M_r of subgrade soils for each parish based on the soil support value. However, soil support value does not represent dynamic load behavior as well as resilient modulus. By determining M_r directly, a site-specific subgrade modulus can account for seasonal variability and provide a more suitable section design responsive to site conditions and projected loading.

According to the AASHTO design guide, "the design subgrade M_r may be determined by laboratory



Falling weight deflectometer

testing, non-destructive testing back-calculation, estimation from resilient modulus correlation studies, or original design and construction data." However, each of these methods yields a different value of M_r. This variation in the value of M_r has a significant effect on the selection of layer thickness using the AASHTO design method. Thus, it is imperative to evaluate M_r values obtained from the different procedures and ascertain the influence of procedural choice on the design thickness of pavement layers.

Objective

The primary objective of this research is to establish correlations of resilient modulus obtained from non-destructive testing equipment, e.g., Falling Weight Deflectometer (FWD) and Dynaflect; in-situ test methods, e.g., Minicone penetrometer and Dynamic Cone Penetrometer (DCP); the current DOTD method; and laboratory repeated load triaxial tests. A secondary objective of this research is to provide a catalog of M_r values for base and subgrade materials used in Louisiana.

Description

Through consultation with LADOTD design personnel, at least 10 ongoing pavement design projects will be selected for evaluation of subgrade materials. Field tests will be conducted simultaneously with the laboratory subgrade soil survey. This will provide an opportunity to compare the current LADOTD design process for pavement typical sections with typical section designs based on results of field tests using FWD, Dynaflect, Minicone, and DCP.

Laboratory determination of resilient modulus values for the subgrade materials will also be performed using repeated load triaxial testing. Laboratory and field test data will be analyzed statistically to establish correlations between M_r values obtained from the various testing methods. Additionally, a sensitivity analysis will be conducted to evaluate the influence of M_r variation on typical section design.

Implementation Potential

Through this research, correlations will be established between values of resilient modulus obtained using various non-destructive test methods and devices, as well as in-situ and laboratory test methods and devices. The results of this research may be used to update the current LADOTD method of determining subgrade resilient modulus. By establishing the accuracy and effectiveness of non-destructive test methods and devices, new methods or procedures may be implemented into the pavement design process.

Repeated load triaxial test