LTRC RESEARCH PROJECT CAPSULE

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TECHNOLOGY TRANSFER PROGRAM

JUST THE FACTS

Evaluation of Current Louisiana Flexible Pavement Structures Using PMS Data and New M-E Pavement Design Guide

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24 months

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SPECIAL POINTS OF INTEREST:

- Problem Addressed
- Objectives of Research
- Methodology Used
- Implementation Potential

PROBLEM

The Louisiana Department of Transportation and Development (LADOTD) is currently using the 1993 AASHTO Pavement Design Guide in pavement design activities. Due to its empirical characteristics and other limitations, this design guide cannot accurately predict the performances of designed pavement structures. The new Mechanistic-Empirical Pavement Design Guide (MEPDG), developed under the National Cooperative Highway Research Program (NCHRP) Project 1-37A, represents a major change as compared to current pavement design practices. LADOTD is following the national trend and beginning the process of implementing the new design guide.

In contrast to existing versions of the AASHTO pavement design guide, which relied heavily on results of the AASHTO Road Test conducted in Ottawa, Illinois in the early 1960s, the new guide is based on a mechanistic-empirical design procedure. It provides a uniform basis for the design of flexible, rigid, and composite (rehabilitated) pavements and employs mechanistic design parameters for traffic, subgrade, environment, and reliability. It is based on an iterative process—the outputs from the procedure are pavement distresses and smoothness, not layer thicknesses. The design procedure adopted in the MEPDG requires the designer to consider site conditions (traffic, climate, subgrade, existing pavement conditions for rehabilitation, etc.) and to propose a trial design. In addition, evaluating the performances of the pavement network in Louisiana will be a necessary step in the near future.

The successful use of the MEPDG requires local validation and calibration of the performance models. A fully calibrated MEPDG for Louisiana is a long-term goal and the calibration process will be continuous along with implementation. Further, the new nationally calibrated MEPDG will require local validation and calibration of the distress models. The Louisiana Transportation Center (LTRC) has sponsored several completed or on-going research projects where results can be used as inputs in the new MEPDG. The proposed study will use the new MEPDG together with data available from LADOTD's Pavement Management System (PMS) and other data sources from LADOTD's main frame to evaluate typical flexible pavement structures currently used and to make changes if warranted, so the Department can get immediate benefits from this new design guide.

OBJECTIVES

The objectives of this study are to evaluate the performances of typical flexible pavement types, materials, and structures currently used in Louisiana using MEPDG and PMS data and to identify areas for future local calibration of the new MEPDG.

METHODOLOGY

To achieve the objectives, typical flexible pavement structures [i.e., asphalt surface over non-Portland cement concrete (PCC) bases] currently used in Louisiana are further categorized into 18 pavement performance groups based upon three climate regions, three design traffic volumes, and two levels of subgrade strengths (3 x 3 x 2 = 18). For each pavement group, three to five pavement sections will be expectedly selected from the Department's Tracking of Projects System (TOPS).

The performance indicators that can be used in the new MEPDG for flexible pavements (e.g., rut depths or different types of cracking) will then be indentified from the PMS database for each selected section. Additional field performance data and pavement structure information for some identified projects will also be collected as needed.

The development of MEPDG input files for each of the selected pavement sections will largely rely on reviewing historical project records and MEPDG default values as well as researchers' engineering judgments. Level 2 or Level 3 inputs for the structural and material characterization input will be the focus of this study. The available data sources include the Material Testing Tracking System (MTTS), "Plan and Proposal," and "Content Manager" data links accessible from the Department's Intranet Web site. The current plan for the MEPDG traffic characterization input is to use the default traffic inputs available in MEPDG and possibly some data from the completed research project 07-2P (Characterization and Development of Truck Load Spectra for Current/Future Pavement Design in Louisiana) if applicable.

With the developed input files, multiple MEPDG runs will be performed on all selected pavement sections. A data quality analysis, statistical and graphical validates analysis, discrepancy causes analysis, and preliminary calibration analysis will be performed based on the predicted and PMS collected performance results. A cost-benefit analysis of using MEPDG over the current AASHTO pavement design guide will also be performed. It is anticipated that, depending on the data availability, research results will provide the following deliverables: (1) a final report with a detailed set of recommendations for the implementation and further calibration of MEPDG in Louisiana will be drafted; (2) a searchable or a step-by-step flowchart-based interface that is aimed to expedite the future efforts in obtaining the required material inputs and PMS pavement performance data for an MEPDG analysis will be available from the results of this study; and (3) a preliminary calibration process for several distress transfer functions used in the MEPDG's flexible pavement design will be provided.

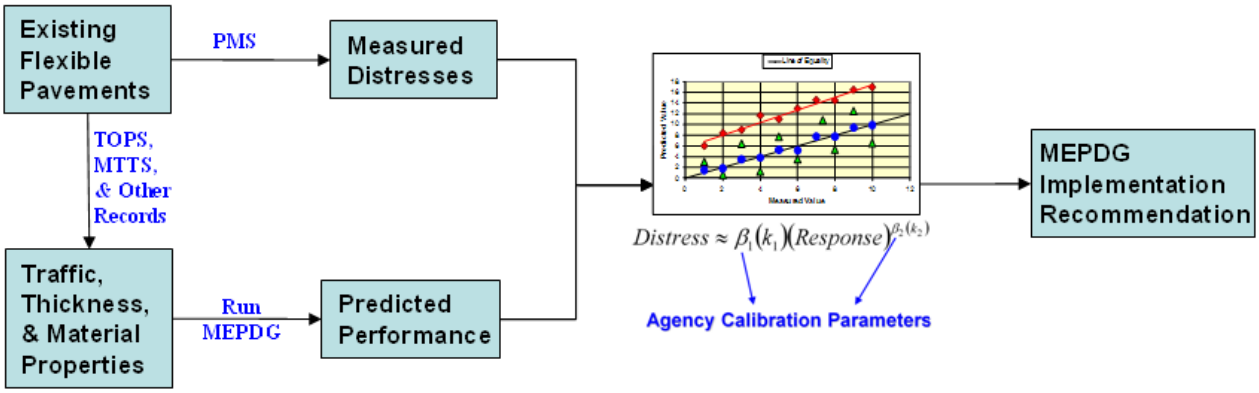

Figure 1
Proposed MEPDG local calibration process

IMPLEMENTATION POTENTIAL

Changes in MEPDG distress models recommended from this study may be implemented immediately by the Department. In addition, the experience obtained on the development of MEPDG input files for existing pavements in Louisiana can be directly implemented in the Department's future efforts of full implementation of the MEPDG in Louisiana.