

Missouri Department of Transportation
Roberta L. Broeker, Interim Director

573.751.2551
Fax: 573.751.6555
1.888.ASK MODOT (275.6636)

November 16, 2015

Dear Research Partner:

The Missouri Highways and Transportation Commission requests proposals from qualified organizations—namely private consultants, universities, and research organizations—to furnish professional engineering services as described in the following request for proposal to be coordinated by the Research Unit of the Construction and Materials Division.

Please submit a proposal for project TR201609 entitled, “Mechanistic Empirical Pavement Design Guide.” Your submittal must include a work plan, the proposed project team and its background, and any related projects now active or recently completed by your organization. The project team must be led by a licensed professional engineer in the state of Missouri and the final report must be sealed, in accordance with the provisions of Chapter 327 RSMo.

The selection committee will use Qualification Based Selection. A “not to exceed” budget amount is included in the RFP to assist with the required scope, but budgets are not to be included with the proposal submissions, and will not be presented to the selection committee.

Please deliver all proposals to my attention in the Research Unit of the Construction and Materials Division as indicated the RFP document by **January 4, 2016**. Questions regarding the RFP may be sent to Jason Collins at jason.collins@modot.mo.gov or 573-526-4325. More information about project contracting in general can be found at: www.modot.mo.gov/services/OR/orRFP.htm.

Sincerely,



Bill Stone
Research Administrator

This document contains information and requirements for only this RFP. A “Standard Requirements” document contains additional needs for all research proposals and contracting. Submitters should review both this document and the Standard Requirements document, available from the Construction and Materials Contract Administrator (identified at the end of this document) or:

www.modot.org/services/OR/orTemplates.htm

TR201609

Mechanistic Empirical Pavement Design Guide

Background:

The Missouri Department of Transportation (MoDOT) has always relied on sound engineering for designing new and rehabilitated pavements. The current design approach is the Mechanistic-Empirical Pavement Design Guide (MEPDG), developed under a series of National Cooperative Highway Research Projects (NCHRP). The MEPDG utilizes existing state-of-the-practice mechanistic-based pavement analysis and distress prediction algorithms. The distress prediction models of the MEPDG were derived from field performance data from several hundred experimental flexible and rigid in-service pavements located throughout the United States and contained in the Long-Term Pavement Performance (LTPP) database and other national databases. These models are hence termed “globally” or “nationally” calibrated models. It was realized that the nationally calibrated models would not necessarily predict pavement performance accurately for all local design, materials, and other conditions, or for a specific geographic area or State. Therefore, there was a need to determine whether the models were a reasonable representation of Missouri conditions.

In 2004, the first local calibration effort in Missouri was initiated to measure the accuracy and reasonableness of the MEPDG models to reflect Missouri’s conditions (site, design, materials, construction, performance, and so on). Inputs included actual historical Missouri pavement design, traffic loading, climate, construction, and materials data. The predicted performance was then compared to real-world performance. The reasonableness of the MEPDG models was gauged based on the goodness of fit and bias in correlation between measured and predicted distress values. Statistical and non-statistical methods were applied as appropriate to determine goodness of fit and bias. Nationally calibrated MEPDG models that were found to be inadequate for local Missouri conditions were then recalibrated. Recalibration was done by

modifying the MEPDG local calibration factors as needed to improve prediction accuracy and remove bias.

Enough time has elapsed to perform a second local calibration cycle. During this interim period, more performance data has been collected from the original field test sections. In addition, newer models have been introduced to the AASHTO Pavements ME Design Guide software that requires a first local calibration. Greater emphasis will be placed on the rehabilitation models.

Objectives:

The objectives of this project are:

- Perform a second local calibration of distress prediction models for existing field test sections.
- Supplement existing test sections with additional rehabilitation pavement sections.
- Perform a first local calibration of newer prediction models in the AASHTO Pavement ME Design Program.
- Update the materials database library with contemporary pavement materials properties, including reclaimed materials.
- Fully document the local calibration work, including clear guidance for changing calibration coefficients. Update the user manual. Provide recommendations and precise details of any suggested/incorporated changes.

Project Requirements and Deliverables:

Task descriptions are intended to provide guidance in development of the research. MoDOT is seeking the input of proposers to determine the best strategies to accomplish the research objectives.

Task 1

Work Plan

A work plan will be developed which details implementation of the following tasks as well as the resources and schedule required to carry them out. The plan would include a pavement section design and materials experimental factorial that reflects current MoDOT pavement type selection practice. For background information about the initial local calibration work refer to the link provided below:

<http://library.modot.mo.gov/RDT/reports/Ri04002/cm08-001v1.pdf>

<http://library.modot.mo.gov/RDT/reports/Ri04002/cm08-001v2.pdf>

Task 2

Laboratory and Field Testing

The laboratory and field testing plan will include desired Pavement ME Design inputs and the means by which to acquire them. Lab testing will be performed on materials common to Missouri mix designs. Of special interest will be the properties of asphalt with reclaimed materials. Pavement sections will consist of ones previously used in the first local calibration and new ones of current interest to MoDOT, primarily thin asphalt overlays, but also bonded and un-bonded concrete overlays. Performance data collected annually by MoDOT on existing test sections since the first local calibration shall be incorporated in the analysis. MoDOT will perform the lab and field testing for this project.

Task 3

Traffic Estimation Procedures

Current MoDOT traffic data collection efforts will be reviewed for adequacy to supply required inputs. Traffic data shall be analyzed to determine suitability of default truck traffic distributions for various functional class roadways.

Task 4

Climate Data Update

Weather station data for Missouri and surrounding states shall be checked for missing data. Holes in data shall be estimated through an approved process to complete weather records.

Task 5

Validation of MEPDG Models

Inputs generated from Tasks (2), (3) and (4) will be used in Pavement ME Design software runs for the selected pavement types. Actual pavement performance will be compared to M-E model prediction results. Statistical analysis will determine the degree of bias and/or error that exists in the predictions and if recalibration of the national models is necessary.

Task 6

Calibration of MEPDG Models

Based on the analysis in Task (5), local calibration coefficients shall be generated through non-linear regression analysis to eliminate or reduce bias and error to acceptable levels. New local calibration coefficients shall be incorporated into the Pavement ME Design software.

Task 7

Design Sensitivity Analysis

Each of the recalibrated models shall have sensitivity analyses performed to determine how the design inputs influence the performance prediction outputs. Critical inputs with heavy influence on performance shall be highlighted.

Task 8

Input Database Library

The AASHTO Pavement ME Design program database library will be customized with complete materials, traffic and climate default information for various functional roadway and pavement design types in Missouri.

Task 9

Final Report

A final report shall be prepared containing an explanation of the pavement and materials testing factorial and subsequent data collection, validation and calibration analysis, sensitivity analysis and design input recommendations. The MoDOT user guide shall also be updated.

Quarterly Reports: Quarterly reports should be submitted throughout the project on the last day of March, June, September and December. The quarterly reports are not intended to replace any additional correspondence between the research team and MoDOT needed to keep the project moving.

Interim Presentation: An Interim presentation shall be scheduled near the mid-point of the project to update MoDOT on the progress and the direction of the project. This is in addition to the necessary communication between the Principal Investigator(s) and MoDOT contacts throughout the project. The purpose of the interim presentation is to evaluate the progress and determine if any mid-project corrections are necessary.

Draft Research Report: A draft of the research report, a draft of the customized library, and a draft of the updated user design guide is due to MoDOT approximately 1 month prior to the final report.

Final Report, Customized Library and the Updated User Design Guide: The final report, customized library and updated user design guide will be due approximately one month before

the end of the contract. This is to allow all billing to be completed prior to the end of the project.

Project Schedule:

The following is an estimate of the project timeline or information on key dates within the project, presuming the project starts by **January 4, 2016**. Proposals need to include a work plan with a proposed timeline. While alternative timelines will be considered, an extension is unlikely. The project timeline will be finalized during the contracting phase.

March 31, 2016: A kick off meeting with MoDOT will be scheduled to discuss project requirements and deliverables.

June 30, 2016: Quarterly report due

September 30, 2016: Quarterly report due.

December 31, 2016: Quarterly report due.

March 31, 2017: Interim Presentation must be done by this date.

June 30, 2017: Quarterly report due.

July 31, 2017: Draft Final Report, Draft Customized Library, and Draft Updated User Design Guide are due. A technical presentation may be requested.

August 31, 2017: Final Report, Customized Library, and Updated User Design Guide are due.

September 30, 2017: Final Invoice due.

(For report templates and a standard form see:
www.modot.org/services/OR/orTemplates.htm)

Special Notes:

Project budget is not to exceed \$250,000. A budget is not to be included in the proposal, but will be required for the contract and must be within this limit.

Based on the results of this project it is possible to have future phases of this research project for development of tests, specifications, and practices.

Reporting templates and standard report forms are available from the Construction and Materials Contract Administrator or the web site:
www.modot.org/services/OR/orTemplates.htm

RFP Requirements:

- Proposals must be no more than 10 pages in length with a font size no less than 11 points. This length limit does not include forms or resumes attached to the proposal.
- The “Standard Requirements” document provides further details and links to the required forms. It is available from the Construction and Materials Contract Administrator or at: www.modot.org/services/OR/orTemplates.htm
- Proposals will be evaluated by an agency and stakeholder team with knowledge and backgrounds in relevant areas for this project. Selection of the successful proposer will be based on the proposer’s demonstrated knowledge in the required areas, the merit of the proposed methods and approach in achieving the desired goals, the experience and qualifications of the team, the plan for ensuring implementation of results, and the adequacy and availability of team members to complete the work in a timely manner.

RFP Schedule:

The following timeline must be met for a proposal to be accepted.

Date:	Action:
November 16, 2015	MoDOT posts RFP to the website: www.modot.mo.gov/services/OR/orRFP.htm
December 7, 2015	Written comments or questions must be submitted to Jason Collins at jason.collins@modot.mo.gov or 573-526-4325
December 21, 2015	MoDOT will post written responses publicly on the website: www.modot.mo.gov/services/OR/orRFP.htm
January 4, 2016	Written proposals must be submitted to Construction and Materials Contract Administrator.
January 25, 2016	MoDOT will notify submitters about project selection, or if needed, about interviews to finalize selection.

Contracting Requirements:

- The successful team will be required to complete additional documentation and enter into a contract such as a “Standard Research Agreement” or “Task Order.” Applicants should be aware of these additional needs so contracting can proceed in a timely manner.
- Standard contracts, forms, attachment templates and additional information are available from the Construction and Materials Contract Administrator or the web site: www.modot.org/services/OR/orTemplates.htm

Contact Information:

Proposals must be either hand delivered by close of business; or faxed, emailed, or mailed by midnight (Central Standard Time) according to time stamp or postmark; on the due date indicated below. Please reference the project title since more than one RFP may be due at one time. **Electronic proposals are preferred.** They may be faxed or emailed to the Construction and Materials Research Administrator:

William.Stone@modot.mo.gov

Fax: 573-522-8416

Proposal packages suitable for duplicating may be submitted by mail or hand delivery to:

Construction and Materials—Research Administrator

Missouri Department of Transportation

1617 Missouri Blvd

PO Box 270

Jefferson City, MO 65109