

Solicitation Number: 1369

Title: Performance and Load Response of Rigid Pavement Systems

Sponsoring Agency: Iowa Department of Transportation

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Lead Agency: Iowa Department of Transportation

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Solicitation Expires: December 31, 2014

Commitment Start Year: FY 2014

Commitment End Year: FY 2018

Duration: 4 years

100% SP&R Approval: Pending Approval

Commitments Required: \$1,200,000

Background: The modern approach to highway design is embodied in the Mechanistic-Empirical Pavement Design Guide (MEPDG), which incorporates models embedded in dedicated software, such as AASHTOWare Pavement ME Design, to predict pavement performance in greater detail than before. Full implementation of the MEPDG by state departments of transportation requires customizing or calibrating the software to state and local conditions, which in turn requires collecting data on climate, material properties, load response,

and pavement performance.

The MEPDG software uses these data inputs to more accurately simulate the load response of pavements and long-term pavement performance. Local calibration of the software involves comparing long-term performance simulation results to actual performance data at local sites if possible or from matching pavements in the LTPP database.

Objectives: This project has these objectives:

1. Collecting load response and performance data and environmental monitoring at selected test pavements for four years.
2. Installing new instrumented sections as needed for a better understanding of rigid pavement response, including monitoring for the duration of the project.
3. Determining the impact of a base on long-term performance of rigid pavement utilizing the data acquired and other nationally available data on the topic.
4. Documentation of the processes, procedures, and findings.
5. Finalization of the rigid pavement design catalog with local validation and calibration of mechanistic-empirical models.

Scope of Work: The project will include the following work:

New York State has previously instrumented test pavement sections to acquire local data to improve calibration of the MEPDG software. The installed sensors are still functioning to an extent that permits collection of additional useful data. This project will continue monitoring of instrumented field pavements in New York, including Interstate 490, Interstate 90, and Interstate 86 in New York using SHRP protocols. Additional sites may be added at the request of funding agencies.

These efforts will include:

1. Pavement surveys and controlled vehicle load tests conducted two times per year at each site. Monitoring of instrumentation already installed at existing test pavements, including (depending on functionality of sensors):
 - load response parameters: surface and intermediate layer deflection, horizontal pavement strain, and subgrade pressure
 - traffic load data gathered by weigh-in-motion sensors or other traffic counters
 - weather parameters such as air temperature, rainfall,

relative humidity, solar radiation, wind speed, and wind direction

- pavement and soil temperatures
- volumetric moisture content in base and subgrade
- strain due to environmental factors

2. Collection of core specimens as needed at test sites. Laboratory testing of cores to determine all material parameters required by the MEPDG, including those for Portland cement concrete, base, and subgrade.
3. Updating of materials characterization database. Expand the materials characterization database with additional data from test sites. These data can be formatted to serve as input to AASHTOWare ME Pavement Design, and may also be used to evaluate other emerging test methods and models.
4. Forensic investigations to determine the causes of and mechanisms involved in any observed premature failures.
5. Annual reports summarizing data and including analyses of environmental data.
6. Generation of a data summary and environmental data analysis related to pavement distress.
7. Updating and populating database, data summary and environmental data analysis.
8. Full instrumentation of a new test section that will be constructed to collect data evaluating the performance of rigid pavement on different foundations. Once constructed, data will be collected as per Tasks 1 and 2 above and incorporated in the deliverables.
9. Development of recommendations for the type of pavement design foundation to be used for rehabilitated rigid pavements based on the modeling and field performance data.

Deliverables:

Project deliverables include:

1. Additional data collected for calibration of pavement performance.
2. Finalization of the rigid pavement design catalog to incorporate mechanistic-empirical methods.

3. Populate the New York DOT database with additional performance data and material testing data.
4. Recommendations for the type of pavement design foundation to be used for rehabilitated rigid pavements based on the modeling and field performance data.
5. Recommendations regarding the impact of dowel bars and tie bars on the long-term performance of rigid pavements.

Comments: BUDGET AND SPONSORSHIP

It is requested that project sponsors provide a minimum of \$5,000 per year for 4 years and that an agency representative serve on the technical advisory committee (TAC). The estimated total project cost for four years of data collection will be \$1,200,000. NY DOT has committed \$1,180,000 and the Iowa DOT has committed to fund \$20,000. Additional partner commitments will result in a reduction in the NY DOT total commitment.

PROJECT ADMINISTRATION

The Iowa Department of Transportation will serve as lead state; administrative duties will be handled through the National Concrete Pavement Technology Center at Iowa State University. Iowa State University will be collaborating with Ohio University for the execution of the project.