Arkansas State Highway and Transportation Department
Transportation Research Committee

RESEARCH PROBLEM STATEMENT

DATE: 08/27/2010 **PROJECT AREA:** Design

TITLE: Site-Specific Ground Motion Response Analyses for the New Madrid Seismic Zone

PROBLEM STATEMENT:

Only a few states in the nation have areas with higher earthquake design ground motions than NE Arkansas. These extreme ground motions result in exceedingly high construction costs for bridges, retaining walls and pile foundations. The recently released AASHTO Guide Specifications for LRFD Seismic Bridge Design (2009) allow the design ground motions obtained from general procedures contained in the code to be reduced up to 33% if site-specific ground motion response analyses are performed. This potential benefit would allow structural inertial loads, and peak ground accelerations used in soil liquefaction analyses and retaining wall designs, to be decreased significantly. Furthermore, the AASHTO Guide Specifications directly mention the deep, soft soil conditions found within the Mississippi Embayment as locations where site-specific ground motion response analyses should be performed. Otherwise, "longer-period [i.e. long-span, relatively flexible] bridges may be under-designed and shorter-period [i.e. short-span, relatively stiff] bridges may be over-designed". Site-specific ground motion response analyses have the potential to save AHTD a great deal of money in their seismic designs. However, the potential benefits have not been realized because procedures do not currently exist to guide AHTD through the steps needed to perform these site-specific analyses.

OBJECTIVES:

The main objective of this study is to develop recommendations that AHTD can use to perform high-quality, site-specific ground motion response analyses in the New Madrid Seismic Zone (NMSZ). While the AASHTO Guide Specifications recommend, and allow one to benefit from, site-specific ground motion response analyses, no guidance is provided as to how these analyses should be performed. The uncertainty in ground motions within the NMSZ, coupled with the deep, soft soils of the Mississippi Embayment, present unique and challenging problems that require further research before these recommendations can be made.

Form of Research Implementation:

The research conducted in the project will immediately and directly impact seismic design at AHTD. Training seminars for AHTD will be held throughout the duration of the project. Furthermore, comprehensive and clear procedures for conducting these analyses will be provided upon completion of the work.

Total Estimated Cost and Project Duration: **$** 145,000 **and** 18 **months.**

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