Arkansas State Highway and Transportation Department
Transportation Research Committee

RESEARCH PROBLEM STATEMENT

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

TITLE: Nonlinear Seismic Site Response of Deep Soil Deposits in East Arkansas

PROBLEM STATEMENT:

The deep soil deposits of the Mississippi embayment have a pronounced yet not fully understood influence on the amplification/attenuation of ground motions associated with the New Madrid Seismic Zone (NMSZ), which is capable of producing large earthquakes (M>7.0). The embayment is a depression that plunges south along an axis that approximates the course of the Mississippi River. It has sediments of clay, silt, sand, and gravel to depths of 500 to 1000 meters. There is an absence of recorded ground motions of significant level (M>5.0) in the embayment. In a study by Pezeshk et al. (1998) titled "Seismic Acceleration Coefficients for West Tennessee", a detailed analysis of the seismic hazard potential and the influence of local soils on anticipated ground motion levels were presented. Since this study was conducted, several advances have been made in the assessment of seismic hazard including the development of one-dimensional non-linear wave propagation models (DEEPSOIL and D-MOD2000). These are nonlinear computer programs for seismic response analysis of horizontally layered soils to evaluate the amplification/attenuation characteristics of the deep soil deposits. The newly developed models are designed to account for the effect of confining pressure on shear modulus and damping properties. The advances also include new geological information and seismicity of the NMSZ.

OBJECTIVES:

In this study typical profiles in East Arkansas are selected to determine whether the new nonlinear site response models will result in different amplifications factors compared to the AASHTO LRFD Guide Specifications' acceleration coefficients. The accuracy and conservatism of amplification factors will be addressed. Ten of the 16 sites that were tested in a previous project (TRC-0803) will be selected. This will provide the soil dynamic properties needed for the top 200 ft. of soil layers at the ten sites. Using a probabilistic seismic hazard analysis procedure, a set of acceleration of time histories will be generated and site response analyses will be performed.

Form of Research Implementation:

A comprehensive report will be written and will be provided to the Arkansas State Highway and Transportation Department (AHTD). A one-day seminar will be hosted for the AHTD discussing the procedure, methodology, and findings of the project.

Total Estimated Cost and Project Duration: **$** 90,000 **and** 12 **months.**

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ADVISORY COUNCIL RANKING	TRC RANKING	Statement Combined with Statement Number(s)
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