LTRC RESEARCH PROJECT CAPSULE

OCTOBER 2010

10-3GT

TECHNOLOGY TRANSFER PROGRAM

JUST THE FACTS

Design Values of Resilient Modulus of Stabilized and Non-Stabilized Base

Start Date:
September 1, 2010

Duration:
18 months

End Date:
February 29, 2012

Funding:
SPR

Principal Investigator:
Khalil Hanifa, E.I.
Geotechnical Research Engineer

Administrative Contact:
Mark J. Morvant, P.E.
Associate Director, Research
225-767-9124

Technical Contact:
Zhongjie "Doc" Zhang, Ph.D., P.E.
Pavement & Geotechnical
Research Administrator
225-767-9162

SPECIAL POINTS OF INTEREST:

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

PROBLEM

The American Association of State Highway Transportation Officials (AASHTO) Mechanistic-Empirical Pavement Design Guide (MEPDG) has recommended the use of laboratory determined resilient modulus of base materials in characterizing pavements for their structural analysis and design. The new DARWin-ME software to be released in the beginning of 2011 requires the resilient modulus of bases as one of the major inputs for pavement design. If Louisiana begins implementing the new MEPDG software, typical values for resilient modulus of base materials, as allowed by the Louisiana Department of Transportation and Development (LADOTD) specifications, need to be established since the Department currently uses the 1993 Pavement Design Guide, which in contrast, requires structural coefficients as an input. These typical resilient modulus values for design will be established to meet Level 2 input criteria, i.e., they will represent measured values from laboratory studies of typical Louisiana materials, versus Level 1 values that are project-site specific. The design values of resilient modulus for stabilized and non-stabilized base materials are not well established for Louisiana. Therefore, it is important and necessary to establish resilient modulus values for base materials from laboratory testing.

Louisiana specifications for construction of bound materials (soil cement, cement stabilized, and cement treated base course) require a specified strength and utilize moisture content and dry density as a quality control; in contrast, specifications for unbound materials (aggregates) are based on moisture content and dry density, all of which are verified through LADOTD TR testing procedures. There is a need to evaluate the design resilient modulus values for the different materials at acceptable in-situ values of moisture content and density (field variation) and to include the layer's resilient modulus in the design of pavement structures. The typical values for resilient modulus of base materials will be based on construction specifications to establish a direct correlation between strength, moisture content, density, and resilient modulus for bound materials and moisture content, density, and resilient modulus for unbound materials. Once the resilient modulus design values for the different materials are determined, the layer's resilient modulus can be included in the design of pavement structures as a Level 2 input.

OBJECTIVES

The primary objective of this research study is to determine design value ranges for typical base materials, as allowed by LADOTD specifications, through laboratory tests with respect to resilient modulus and other parameters used by pavement design guides.

METHODOLOGY

In order to achieve the stated objective, typical base course materials used for Louisiana roadways, as allowed by LADOTD specifications, will be identified and evaluated by the research team. Base course materials, not previously researched by LTRC for resilient modulus design values, included in this study are soil cement, cement stabilized base course materials, cement treated base course materials, and base course aggregates. The base course materials will be collected from the local districts based on availability. Researchers will conduct LADOTD TR testing procedures to determine basic materials properties to include Atterberg limits, gradation (including sieve and hydrometer analysis), and Proctor compaction analysis. In addition, researchers will conduct mechanical properties tests like tube suction tests, unconfined compressive strength (UCS) tests, and California bearing ratio (CBR) tests. To establish resilient modulus design values, repeated loading triaxial (RLT) tests for resilient modulus will be conducted. Once the testing is complete, the data will be analyzed and design values for resilient modulus will be established for each base course material.

IMPLEMENTATION POTENTIAL

By the end of the proposed research, base resilient modulus design values will be established as Level 2 input in the AASHTO Mechanistic-Empirical Pavement Design Guide procedures of new and rehabilitated pavement structures.