RESEARCH
PROJECT CAPSULE [11-3GT]
February 2011
TECHNOLOGY TRANSFER PROGRAM

Accelerated Load Testing of Geosynthetic Base Reinforced Pavement Test Sections

JUST THE FACTS:

Start Date:
December 1, 2010

Duration:
18 months

End Date:
June 1, 2011

Funding:
SPR/TenCate Geosynthetics

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Mehodology Used
Implementation Potential

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PROBLEM

Due to the soft nature of Louisiana soils, in many cases, pavements have to be built over soft subgrade soil, which is often associated with many design and construction difficulties. The design of flexible pavements over weak subgrades has been always a challenge for pavement design engineers. A traditional solution to this problem includes replacing part of the subgrade, appropriate sizing of pavement and base course layers thickness, and/or stabilizing/treating weak subgrade with cementatious materials. The common practice in Louisiana is to stabilize/treat the upper part of subgrade with cement or lime, depending on the subgrade soil type, to create a working platform through improving the engineering strength/stiffness properties of the subgrade. This will help eliminate the problem and reduce the risks of excessive permanent deformations (rutting) by spreading the tire pressure into a wider influence area, which will reduce the vertical pressure acting on top of the untreated subgrade layer. However, the difficulty of stabilizing/treating very weak subgrade soil with cement or lime in certain conditions calls for an alternative solution. The use of geosynthetics to stabilize the subgrade and reinforce the base aggregate layer within the pavement structure can offer a cost-effective alternative solution to this problem.

OBJECTIVE

The main objective of this research is to evaluate the benefits of geosynthetic stabilization and reinforcement of subgrade/base aggregate layers in flexible pavements built on weak subgrades and the effect of pre-rut pavement sections, prior to the construction of the hot mix asphalt (HMA) layer, on geosynthetics benefits and performance. This will be achieved through conducting accelerated load testing on geosynthetic reinforced unpaved and pavement test sections to be constructed at an accelerated loading facility (ALF) site. Different types and configurations of geosynthetics will be considered.

Another objective is to evaluate the design parameters of geosynthetic reinforced flexible pavement in terms of the 1993 American Association of State Highway and Transportation Officials (AASHTO) pavement design guide and the Mechanistic-Empirical Pavement Design Guide (MEPDG) that can provide a more suitable pavement structure design responsive to site conditions and projected loading.

METHODOLOGY

The following major tasks will accomplish the designated research objectives:

- ***Task 1 :*** Conduct a comprehensive literature survey on relevant published works.
- ***Task 2 :*** Design, instrument, and construct test lane sections.
- ***Task 3*** : Conduct accelerated load tests on the sections.
- ***Task 4 :*** Conduct cyclic plate load tests on the sections.
- ***Task 5 :*** Analyze experimental test results.
- ***Task 6 :*** Conduct a cost benefit analysis and implementation plan.
- ***Task 7 :*** Prepare a final report.

IMPLEMENTATION POTENTIAL

By the end of the proposed research, the benefits of the geosynthetic subgrade/base stabilization/reinforcement in pavement structures built on weak subgrades will be demonstrated in terms of increasing the service life of the pavement structure and/or reducing the base thickness. The improvement in design life can be used to back-calculate the equivalent thickness of the base course layer that will correspond to the same design life. The research team is expected to provide the Louisiana Department of Transportation and Development (LADOTD) with typical design parameters of geosynthetic reinforced flexible pavement in terms of the 1993 AASHTO pavement design guide and possibly in terms of MEPDG. This can be achieved through back-calculation to evaluate an equivalent base layer coefficient for reinforced base and/or evaluate a composite resilient modulus for the stabilized subgrade. The researchers are also expected to provide LADOTD pavement engineers with guidance on how to include the geosynthetic reinforcement in the design of flexible pavements.