

## **Evaluation of Geosynthetics Reinforcement in Flexible Pavement Structures Using Accelerated Pavement Testing (RES2013-30)**

### **Purpose of the project**

The main purpose of this research project is to use an accelerated pavement tester (APT) to evaluate the performance of geosynthetics-reinforced granular base of flexible pavements. The tasks include constructing a test pit for the accelerating tests, identifying the best-performing geosynthetics products for the typical granular base used in Tennessee, determining the depth that maximizing the reinforcement of the geosynthetics, and analyzing the economic benefits of using geosynthetics in granular base of flexible pavements.

### **Scope and Significances of the Project**

With the ever increasing traffic volume and the ever shrinking operational budget, it is a great challenge for state transportation agencies to maintain a well-functioning highway system. Many states have been striving to explore alternatives to existing methods of designing, constructing, and rehabilitating flexible pavements. Use of geosynthetics reinforcement in base or subbase layers offers such an option. It is generally believed that use of geosynthetics reinforcement in base layers of pavement structure can extend the service life of flexible pavements and/or reduce the pavement's structural thickness.

This research project aims to use the accelerated pavement test pit at the University of Tennessee, Knoxville (UTK) to investigate under what circumstances the geosynthetics reinforcement can be mobilized in pavement base and how to maximize their reinforcing benefits. The scope of the research includes:

- Identify the most suitable geosynthetics products for the typical granular base used in the flexible pavements construction of Tennessee.
- Determine the optimal location for geosynthetics reinforcement in pavement base layer using the UTK test pit;
- Compare the cost-effectiveness of geosynthetics-reinforced pavements with non-reinforced conventional flexible pavements.

### **Expecting Outcomes**

The research group in the University of Tennessee will work closely with TDOT engineers and staff to seek inputs and recommendations such as choice of geosynthetics products for the study. The following outcomes are expected upon the completion of the project:

- Recommendations on the most suitable geosynthetics products for the typical granular base of Tennessee.
- An alternative design methods for granular-base flexible pavements reinforced with geosynthetics;
- The optimal installation depth of geosynthetics which will maximize the reinforcement effect.
- An economic comparison results for granular-base flexible pavements with or without geosynthetics reinforcement.

### Time Period and Status of the Project

The project started on August 1, 2015, and is expected to complete on July 31, 2018. The project is now running smoothly as planned. Figures 1 through Figure 5 show the equipment of APT, test section structure and construction of the test sections in the pit completed so far.



Figure 1. Accelerated Pavement Tester (APT)



Figure 2. Structure of the Test Pit



Figure 3. Testing the Density of the Subgrade Using Dynamic Cone Tester



Figure 4. Construction of the Subgrade in the Test Pit



Figure 5. Paving of the Asphalt Mixture in the Test Pit

### Contact information

Primary Investigator (PI):  
Baoshan Huang, Ph.D. P.E.  
Dept. of Civil and Environmental Engineering  
The University of Tennessee, Knoxville  
Knoxville, TN 37996  
Phone: 865-974-7713  
E-mail: [bhuang@utk.edu](mailto:bhuang@utk.edu)

Co-Primary Investigator (Co-PI):  
Xiang Shu, Ph.D.  
Dept. of Civil and Environmental Engineering  
The University of Tennessee, Knoxville  
Knoxville, TN 37996  
Phone: 865-974-2608  
E-mail: [xshu@utk.edu](mailto:xshu@utk.edu)

Mbakisya A. Onyango, Ph.D.  
Dept. 2502 Civil Engineering  
The University of Tennessee at Chattanooga  
Chattanooga, TN 37403-2598  
Phone: 423-425-4311  
E-mail: [Mbakisya-Onyango@utc.edu](mailto:Mbakisya-Onyango@utc.edu)