SOUTHERN PLAINS TRANSPORTATION CENTER

SPTC Brief

Highlighting Developments at Southern Plains Transportation Center
June 2016

SPTC RESEARCHERS, TLC STUDENTS PRESENT AT LA TRANSPORTATION CONFERENCE

OVERVIEW: This year's Louisiana Transportation Conference was a great success, hosting over 1,500 participants, 75 vendors/exhibitors and 72 presentation sessions. The conference was held at River Center in Baton Rouge, Louisiana from February 28 through March 2, 2016. One of the highlights of the conference was the special session by the U.S. Secretary of Transportation Anthony Foxx. Louisiana Tech University, a consortium member of the Southern Plains Transportation Center (SPTC), participated in the events.

TLC STUDENT PARTICIPATION: The SPTC facilitates Transportation Leadership Council (TLC) student chapters throughout Region 6. A Louisiana Tech University team comprised of TLC students won first place in the Conference's senior design project competition, outperforming three other local universities (Figure 1).

Figure 1 TLC members/competition winners include (from left to right): Jean-Paul Sandrock, Morgan Harris, Herman Velazquez, Dalton Champagne

The team's award-winning project entitled "T.L. James Lake Pedestrian Bridge" was sponsored by the Louisiana Purchase Council. It was incorporated into a senior design course at Louisiana Tech taught by Dr. Henry Cardenas and Dr. Nazimuddin Wasiuddin. Students were supported by their TLC advisor, Dr. Wasiuddin, and the SPTC associate director for Louisiana Tech, Dr. David Hall.

SPTC RESEARCHERS PARTICIPATION: Two of the conference sessions were reserved for University Transportation Center (UTC) presentations. SPTC researchers at Louisiana Tech, Dr. N. Wasiuddin and Dr. Jay Wang, delivered three presentations featuring three projects funded by SPTC and Louisiana Transportation Research Center (LTRC).

Dr. Wasiuddin presented SPTC Project 14.1-80 on replacement of force ductility test (AASHTO T300) and LTRC Project 11-2B on replacement of Elastic Recovery Test (AASHTO T301). Currently, asphalt emulsions and binders used in asphalt pavements are evaluated by tests and specification that are not directly and fully related to pavement performance. When project outcomes are implemented, these new specifications will improve pavement performance as well as save significant testing time.

The Multiple Stress Creep Recovery (MSCR) procedure (AASHTO TP70) at 58°C has been recommended to replace the elastic recovery test (AASHTO T301). At 0.1kPa creep stress, a minimum percent recovery of 25 and at 3.2kPa, a minimum percent recovery of 9 are recommended to identify the presence of polymer, replacing elastic recovery test (AASHTO T301) (Figure 2).

It is also recommended that at 58°C, a maximum phase angle of 81° and a minimum MSCR percent recovery (at 0.1kPa creep stress) of 30 can be specified to replace force ductility test (AASHTO T300). These criteria are applicable for emulsion residues prepared according to the low temperature evaporative method specified in ASTM D7497. The research is underway to develop specifications for hot asphalt binder.

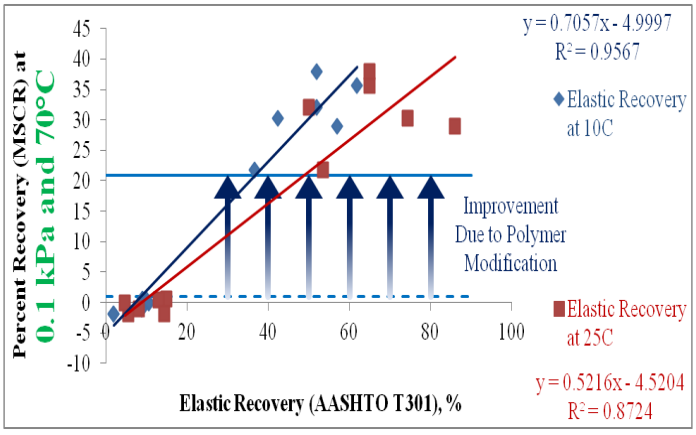

Figure 2 Correlation between elastic recovery (AASHTO T301) and percent recovery in MSCR (AASHTO TP70)

Another project presented by Dr. Wasiuddin, funded by LTRC, documented the benefits of the innovations implemented in the Highways for Life (HfL) Demonstration Project – LA 511. The project location at 70th Street (Line Ave to Fern Ave, 1.03 mile) in Shreveport, Louisiana is one of the busiest and accident prone highways in the area. Major construction innovations were implemented. Throughout the project the team collected data for friction, noise, density, construction time, roughness, accidents, economic analyses and user satisfaction survey. The life cycle cost analyses show that the baseline case (construction without innovations) is estimated to save approximately $1.27M in terms of 2012 NPV based on a 5-year analyses period. The as-constructed (with innovations) case is estimated to save approximately $2.96M. The average user satisfaction ratings before and after construction are 2.78 and 4.42, respectively, in the Likert scale of 5 where 5 is "very satisfied", which meets the HfL goal.

Dr. Jay Wang presented preliminary achievements from project SPTC 14.1-76 for characterizing the expansive soils in northern Louisiana. Understanding unsaturated expansive soil has always been a major challenge for soil scientists and engineers. Research work of fundamental soil index properties, the soil water characteristic curve (SWCC), the shrinkage curve of the expansive soil, and the three-dimensional constitutive surface, etc., were completed. They are significantly important in identifying expansive soil, determining its volume change behavior, and designing highway pavement on the expansive soil. Using soil data from each of the 64 parishes in Louisiana a state-of-the-practice map to show the distribution of expansive soils and their degrees of severity over Louisiana based on the calculated swelling potential was plotted using the ArcGIS software.

The Atterberg limits (LL 79; PI 51) and the activity (A_C) 1.37 indicated that the soil was highly expansive. Predicted heaves using five different methods were varied as widely as 16% and the swelling potential (SP) of the soil was found to be 7.22%. After comparing the SP values with those achieved in different areas in the USA and around the world, it strongly suggested that the expansive soil in northern Louisiana is one of most expansive soils in the world (Figure 3).

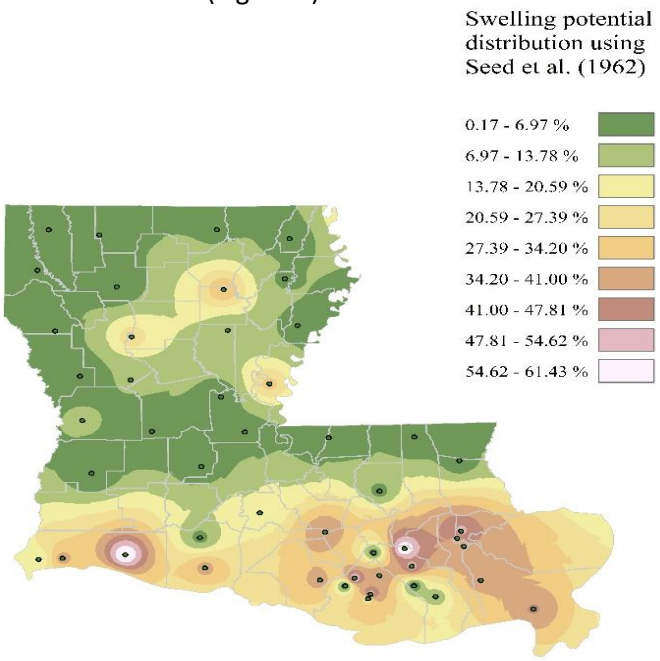

Figure 3 Swelling potential distribution of soils in Louisiana

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