Technology Today

Vol 22
No. 1

LTRC

2007

A publication of the Louisiana Transportation Research Center

2007 Louisiana Transportation Engineering Conference

The Louisiana Transportation Research Center held the 2007 Louisiana Transportation Engineering Conference at the Baton Rouge River Center February 11-14.

The conference is held on a biennial basis and is intended to foster a better relationship and greater understanding between DOTD, FHWA, and the transportation industry (contractors, consultants, universities, suppliers, and parish/local agencies). The

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New Conference Venue

If the attendees of the 2007 Louisiana Transportation Engineering Conference can be considered customers of those who put on the show, customer satisfaction seems to have been at an all-time high. Conference goers reported being extremely satisfied with the conference itself and most aspects of the new venue, the Baton Rouge River Center.

Many attendees expressed their thanks to LTRC and its associates for giving interested parties the opportunity to attend a professional, well organized conference with informative sessions, interesting displays, and networking opportunities. One such attendee said, “I was really impressed with the conference this year. It was a big step up from the past years. Everyone that helped to make it a success should be very proud.”

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2007 Louisiana Transportation Engineering Conference

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conference could not be held as scheduled in 2006 because of the lingering effects of Hurricanes Katrina and Rita.

The Program Committee planned and brought to fruition 72 technical sessions, several how-to clinics, and a myriad of alternative sessions dealing with various management and workplace issues.

Many in attendance at the 2007 conference received credit for up to 16 professional development hours (PDH), one of which is the biennially required hour in Professional Ethics.

A conference Web site allowed for online registration and provided extensive program information.

The Use of Geogrid in Flexible Pavement Systems

The Louisiana Transportation Research Center has been conducting research studies to investigate the possible use of geogrids to extend the service life of pavement structures or to reduce the base course thickness for a given service life. Geogrids are extruded sheets of polyethylene or polypropylene with apertures punched in a regular pattern. The key feature of geogrids is that the apertures are large enough to allow soil strike through from one side of the geogrid to the other. The ribs of the geogrids are often stiff compared to the fibers of geotextiles. The rib strength and junction strength are important parameters. The reason for this is that the soil strike-through within the apertures bears against the transverse ribs, which transmit the forces to the longitudinal ribs via the junctions. The junctions are where the longitudinal and transverse ribs meet and are connected. The geogrids are commercially available at different types (sizes and shapes) and tensile strengths.

One primary benefit of a geogrid in a pavement system that has been used by the Louisiana Department of Transportation and Development was the construction aid over soft subgrades. The presence of geogrids in a pavement structure reduces the amount of pressure transferred into the subgrade by spreading the tire pressure into a wider area, thus reducing the amount of permanent deformations (rutting) on the surface asphalt layers. However, there are other benefits of the geogrids that are still under investigation.

Recently, a research study was conducted to characterize the behavior of geogrid reinforced materials. The evaluation used experimental testing and numerical modeling programs. The experimental testing program included conducting Repeated Loading Triaxial (RLT) tests on unreinforced and geogrid reinforced base course samples. The results of the RLT test demonstrated that the geogrid significantly reduced the base course material permanent deformation under cyclic loading, but it did not show appreciable effect on their resilient deformation. For pavement sections built on top of weak subgrade soils, the finite-element modeling program showed that the geogrid reinforcement resulted in an appreciable reduction in permanent deformation with medium to thin base layer thickness. The greatest values of improvement were shown with the thin base layer thickness. The geogrid reinforcement had modest to high values of improvement in fatigue life of pavement structure.

Currently, the LTRC is continuing to validate the results obtained from the aforementioned finite-element analysis. This study includes constructing small-scale test sections in a test box (Figure 1) and testing them under loads and conditions similar to those encountered in the field.

Staff Accomplishments

Louay N. Mohammad, Ph. D., Engineering Materials Characterization and Research Facility Manager, was appointed chair of the Transportation Research Board Committee on Characteristics of Bituminous-aggregate Combinations to Meet Surface Requirements.

For the most part, visitors to the conference seemed to be extremely impressed with the River Center. People commented on the ample space provided for mingling and networking, the large vendor display area, ease with regard to traffic and parking, and the overall convenience of the downtown location.

One enthusiastic attendee said, “Overall, this was the best conference I’ve ever attended. The change in venue really made a difference to me.”

Another claimed to have been to conferences all over the United States and stated that “this was one of the best.” Most who gave feedback are hoping the next conference, in 2009, will be held at the River Center.

Conference patrons enjoyed informative sessions while earning required professional development hours. Most had high praise for the sessions, complaining only that they did not have time to attend more of them. Learning job-related information was a big plus for many who attended the sessions and the conference in general. The planning and construction visuals garnered positive feedback, and spectators commented that the facilities allowed for the best exhibits yet.

Student Shadowing

Student Shadowing was a new program incorporated into the engineering conference this year. The program was introduced to familiarize college junior and senior engineering students with the many opportunities and engineering disciplines available within the DOTD. The goal of the program was to encourage students to consider careers in transportatio, particularly with DOTD. DOTD Human Resources coordinated the effort to match students and DOTD mentors based on areas of interest and/or geographical location.

Students accompanied their mentors to technical sessions, DOTD table displays, and vendor exhibits. Mentors were asked to introduce their students to DOTD employees and administrators and take the opportunity to discuss the multitude of positive aspects of employment with DOTD.

Of the eighteen students that signed up for the program, only about half were actually able to participate. The fact that Student Shadowing was initiated at a relatively late date in the planning of the 2007 conference was considered the major reason for the relatively low student turnout. Though participation was lower than anticipated, the program was ultimately considered a success, based on the positive feedback received by both the students and DOTD mentors.

Student Shadowing allowed for a first contact between DOTD and prospective engineers. Some mentors have made an effort to keep in touch with their students since the conference, as keeping the lines of communication open certainly stands to enhance recruiting opportunities.

Student shadowing will be offered at the next conference, with a greater emphasis on marketing the program at the state universities at an earlier date and providing for greater flexibility in scheduling. The feedback received, in conjunction with the ideas and input from HR personnel and program mentors, will facilitate various improvements to the program.

The Stability of Calcium Sulfate Base Course in a Wet Environment

Blended calcium sulfate (BCS) is fluorogypsum (FG), an industrial byproduct, blended with lime or limestone. Approximately 90,000 metric tons (100,000 tons) of FG are generated annually in the United States, posing a serious problem for environmental disposal. The Louisiana Department of Transportation and Development (LA DOTD) has been using BCS in pavement construction over the last 15 years on a trial basis. While this material has performed satisfactorily in general post-construction conditions, its moisture sensitivity concerns LA DOTD engineers because it is difficult to construct in wet environments. Laboratory tests were conducted in an effort to identify factors that significantly affect the strength development of raw BCS and to discover a suitable stabilization scheme for ameliorating water susceptibility of raw BCS. Laboratory tests also investigated the resilient modulus and permanent deformation characteristics of stabilized BCS. Samples tested in the laboratory had been molded in the laboratory and cored at the test site of the Pavement Research Facility (PRF) at the Louisiana Transportation Research Center (LTRC).

A field test program included two parts: (1) building a full scale test section at the PRF site according to proposed construction specifications and (2) evaluating the performance of stabilized BCS base courses through in-situ tests, such as DCP, FWD, and DYNAFLECT, to characterize strength and structural properties.

The results from the study indicate that moisture content controlled the strength of raw BCS, although factors such as dry unit weight also influenced the result. Curing conditions affect the strength of raw BCS through the change of moisture content in the material. The loss and regaining of strength is generally a reversible process, and the presence of free water among gypsum crystal particles is the reason for this phenomenon. BCS stabilized by 10 percent 120-grade GGBFS by volume can serve as a good pavement base. It achieves a higher level of stiffness, and a structural level coefficient of 0.30 can be used for pavement design purpose. The tentative construction specifications used in the study proved to be adequate for the field construction. Researchers recommend that the LA DOTD consider building several field test sections in different traffic and environmental conditions using the GGBFS-stabilized BCS as pavement base course.

Hurricane Season Pavement Assessment

On August 29, 2005, Hurricane Katrina devastated New Orleans and southeastern Louisiana, leaving hundreds of thousands of people displaced or homeless. Nearly four weeks later, Hurricane Rita made landfall in the southwestern portion of the state, further damaging Louisiana's infrastructure and impacting the New Orleans area. In response, LTRC personnel conducted pavement testing on several ongoing construction projects (that were submerged) to determine if contract modifications would be necessary to address damage impact. Damage was found in asphalt and concrete layers, and sub-grades were found to be very weak. For one project, LA 46, LTRC had "before and after" data which indicated that the damage incurred was equivalent to three inches of asphalt concrete.

As a result, LaDOTD contracted with Fugro Consultants, LP, to conduct testing on 238 miles of state highways in New Orleans at 0.1 mile intervals. Fugro conducted Falling Weight Deflectometer, Ground Penetrating Radar, and Dynamic Cone Penetrometer testing and cored selected locations for thickness and damage
verification to determine the extent of structural damage to the pavements. Because there was no "before" data, a traditional forensic type analysis could not be undertaken. With the use of GIS mapping and NOAA flood mapping, data points could be identified as either submerged or non-submerged. The non-submerged data points were then considered as a control set, and the submerged data points were considered as the experimental set. In this manner, the data could be tested using standard analysis of variance techniques to test the hypothesis that the submerged pavements were weaker and therefore damaged as a result of the hurricanes. It is noted that this methodology does not imply that the non-submerged pavements were not damaged but provides a relative damage estimate. Once weaker strength parameters were determined, standard pavement design methods were applied to the structural numbers and sub-grade moduli to determine an equivalent amount of asphalt concrete for this strength loss.

In general, it was found that asphalt pavements had strength loss equivalent to about two inches of new asphalt concrete and that thinner asphalt pavements were weaker than the thicker pavements. Very little relative damage was detected for the PCC pavements. The composite pavements demonstrated no need for additional structure in the pavement layers; however, a weaker sub-grade for the submerged areas equivalent to nearly one inch of asphalt concrete was identified. Using recent bid prices of $250,000 per mile for a typical rehabilitation scenario in New Orleans (mill four inches/replace four inches of asphalt concrete), an estimated cost for the approximately 200 miles of submerged state highway pavements would be $50 million.

Comparative Evaluation of Subgrade Resilient Modulus from Nondestructive, In-situ, and Laboratory Methods

A study was done in an effort to provide assessment methodologies that could be used by design, construction, or maintenance groups to accurately and consistently determine the resilient modulus of subgrade soils from nondestructive and in-situ testing devices without having to perform costly, time consuming laboratory tests. This was achieved by developing a statistically viable testing factorial that provided correlation equations between laboratory tests and the falling weight deflectometer, Dynaflect, miniature cone peneotremeter, and dynamic cone peneotremeter. Obtaining accurate resilient modulus readings can enhance pavement performance and the judicious usage of fiscal resources by preventing the pavement structure from being either underdesigned or overdesigned. Overdesigns waste scarce resources by causing excessive pavement thickness, and underdesigns lead to premature pavement failures and excessive maintenance costs.

Technology Today Publication Statement

Technology Today is a quarterly publication of the Louisiana Transportation Research Center, administered jointly by the Louisiana Department of Transportation and Development and Louisiana State University. For additional information on material included in this newsletter, contact the editor at (225) 767-9145, Louisiana Transportation Research Center, 4101 Gourrier Ave., Baton Rouge, LA 70808-4443.

This public document is published at a total cost of $1192.00. Seventeen hundred copies of the public document were published in this first printing, at a cost of $920.00. The total cost of all printings of this document, including reprints, is $1192.00 This document was published by Louisiana State University, Graphic Services, 3555 River Road, Baton Rouge, to report on the research and training of the Louisiana Transportation Research Center as required in R.S. 48:105. This material was duplicated in accordance with standards for printing by state agencies established pursuant to R.S. 43:31. Printing of this material was purchased in accordance with the provisions of Title 43 of the Louisiana Revised Statutes.