IMPLEMENTATION IMPACTS

Louisiana Implements New Transportation Research

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LTRC

Created by the Louisiana legislature in 1986, LTRC's mission is to effectively merge the resources of the Department of Transportation and Development (DOTD)/ LTRC and state universities to provide transportation related research, education, and training in a manner that addresses the problems and needs of DOTD and the transportation industry, supports local government, advances transportation technology, benefits Louisiana's universities, and provides optimal return on taxpayers' dollars.

LTRC's functions and duties are to develop and conduct a nationally recognized research program in transportation systems; offer educational and training programs; develop and implement a technology transfer program; establish cooperative relationships with universities, associations, and agencies; and report and publish research findings.

Located on the LSU campus in Baton Rouge, LTRC provides researchers and students access to excellent laboratories and state-of-the-art research equipment. The unique position of LTRC provides access to virtually all of DOTD's and LSU's resources to pursue its mission.

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Study Provides New Tack Coat Implementation on National Stage

LTRC develops test methods to better monitor quality and performance

Based on the results from a recent NCHRP tack coat study performed by LTRC, Louisiana has plans to incorporate new tack coat materials into the state's pavements. Tack coats are thin layers of asphalt product that are used in the construction or resurfacing of roads and highways, so the selection of an optimum tack coat material is crucial in the development of proper bond strength between pavement layers. In an effort to go one step further to provide ultimate pavement performance, the state also plans to adjust tack coat application techniques after two new test methods were developed by the research study engineers.

The Louisiana Tack Coat Quality Tester (LTCQT) and Louisiana Interlayer Shear Strength Test (LISST) were developed after researchers examined current application methods, application rates, asphalt binder materials, equipment types, and calibration procedures for the various uses of tack coats. These tests have also been used in forensic evaluations of several failed pavements.

As a result of this research, LTRC has recommended changes to relevant AASHTO methods and practices related to tack coats within the Department. These recommendations from the NCHRP and LTRC study are also currently being implemented in standard specifications around the country. Furthermore, foreign transportation authorities have also implemented the results of this research into their respective specifications.

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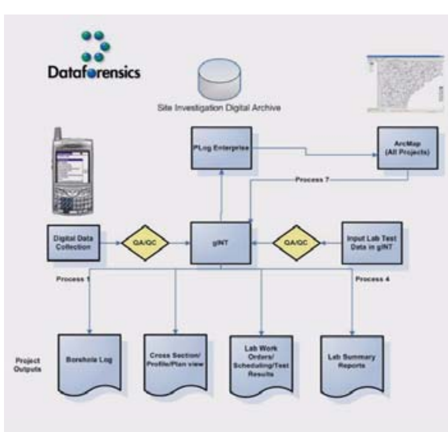
LTRC Project No. 06-4B
Optimization of Tack Coat for HMA Placement



New DOTD Database Aids in Cost-Effective Future Infrastructure Design Decisions

LTRC researchers are wrapping up the second phase of a project establishing an online database that provides engineers and designers access to valuable geotechnical data (soil strength, material type, etc.), so they are able to make confident and cost-effective road and bridge designs. The database is mostly comprised of boring logs, which are records of soil strengths and material properties obtained from drilling in different locations across the

[DOTD Database continued]

state. These borings contain information specific to what was encountered in the soil while drilling, so engineers are able to use these details to calculate bearing capacities and design effective and long-lasting foundations.

By introducing this database, a single system was created for collecting, managing, archiving, and retrieving the vast amount of geotechnical data that are collected or generated by DOTD each year. While the first phase of this project was spent collecting and storing existing data, the second phase of the project focused on the integration of historical, current, and future data to create a more composite database, which creates an even larger knowledge base available for Louisiana researchers, engineers, and designers.

Additions of geotechnical data to the system (historical and future) will continue to show benefit to the Department and can be accomplished by DOTD staff. In addition to future design savings, the in-house developed database is worth thousands of dollars and man-hours saved. If DOTD were to try and re-create this same data by re-investigating (drilling, sampling, testing, reporting, etc.) the same sites, the cost would be at least $16,000,000. Accordingly, the return on investment for this task is extraordinary as approximately $200,000 was expended to turn $16,000,000 worth of data into a usable asset.

The project was so well-received that additional modules in the form of a third phase are planned to cover shallow boring data, pile load test data, and other valuable geotechnical information.

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LTRC Project No. 10-2GT
Geotechnical Information Database, Phase II

Research Shows Saw-and-Seal & Chip Seal Most Promising for Pavement Crack Control

Among the various crack control treatments that were analyzed in a recent LTRC research project, the saw-and-seal and chip seal methods showed the most promising results in terms of performance and economic worthiness. Based on these findings, DOTD has reduced or eliminated the use of less cost-effective treatments.

The saw-and-seal method deals with applying asphalt on top of concrete slabs and then sawing where the spaces (or joints) between each concrete slab are located. The freshly opened space is then sealed with a special asphalt material that keeps foreign objects from getting into the roadway. Chip seal is a pavement surface treatment consisting of an application of asphalt emulsion or asphalt cement and fine aggregates (or mixtures of sand, gravel, crushed stone, etc.) to the top of the asphalt, effectively sealing the pavement in that manner. When used as an interlayer under an asphalt concrete surface, it absorbs the energy of crack propagation and delays reflective cracking.

The average level of improvement to the pavement service life due to the use of saw-and-seal was 4 years. Eighty percent of the sites showed that saw-and-seal is cost-effective as compared to regular hot mix asphalt (HMA) overlays without the treatment. The increase in cost from doing a regular HMA overlay to a saw-and-seal treatment ranged from 0.5 to 21 percent.

Regarding chip seal, 25 percent of the chip seal sites showed an improvement range of 1 to 3 years, while 33 percent of the sites showed an improvement range of 4 to 10 years. The average level of improvement to the pavement service life due to the use of chip seal was 2 years. The vast majority of the sites (75 percent) showed that chip seal is also cost-effective as compared to regular HMA overlays. The increase in cost of overlay due to chip seal treatment ranged from 10 to 71 percent.

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LTRC Project No. 08-1P
Cost Effective Prevention of Reflective Cracking of Composite Pavement

Conversion to Five-lane Roadways Show >40% in Crash Reductions

Recent research at LTRC has shown more than 40% in crash reductions as a result of adding a turning lane to an existing four-lane roadway.

Researchers at University of Louisiana at Lafayette (ULL) developed a Louisiana crash modification factor (CMF) for converting a four-lane urban undivided roadway to a five-lane roadway. DOTD has re-striped several segments of urban undivided four-lane roadways to five-lane roadways with a center two-way left turn lane by re-striping pavement markings (without increasing pavement width) in three DOTD districts.

Based on a statistical analysis with six years of crash data (three years before project and three years after project, excluding the project implementation year), the CMFs for all roadways are estimated to be less than 0.6 with a standard deviation less than 0.07, which translates to a 40% crash reduction.

Estimated benefits were determined by applying FHWA-estimated costs for injury crashes and property-damage-only crashes to the crash reduction numbers. The impressive (>40%) crash reductions associated with this lane conversion clearly demonstrate it a feasible solution under financially constrained conditions. Considering the huge benefit/cost ratio from lane-conversion (re-striping), DOTD plans to continue using this crash countermeasure on urban, undivided roadways on a case-by-case basis.

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LTRC Project No. 08-3SS
Developing a Louisiana Crash Modification Factor for Converting Four-lane Urban Undivided Roadway to Five-lane via Re-striping

Health Monitoring of Newly Integrated Detail Reveals Problems

The John James Audubon Bridge adopted a new continuity detail for parts of the bridge, which allows for a more continuous structure with longer road spans, better ride quality, and lower maintenance costs. However, while this new detail has recently been incorporated in AASHTO-LRFD specifications to simplify construction and decrease costs, LTRC researchers found a few problems while monitoring its performance for future use possibilities. Researchers evaluated one segment of Bridge #2's structural health for two years. As a result, the health monitoring data revealed troublesome thermal effects and unexpected stresses, which led to concrete cracking in that location.

The results of this study were presented to the AASHTO Bridge Subcommittee to inform designers of the necessity of considering temperature variations and potential stresses of the detail in the current AASHTO provisions.

In Louisiana, it was decided that a new continuity detail where only the road is continuous over the spans be the standard. This is the least restraining detail for girder ends. As a result, a continuity detail that delivers a smoother ride that is almost maintenance free is achieved without the potential for girder-end cracking.

Observed crack at bottom flange of Girder G3 of Span 24

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LTRC Project No. 08-1ST
Evaluation of Continuity Detail for Precast Prestressed Girders

Louisiana Legislature Acts on Recent Overloaded Sugar Cane Truck Research

At the request of the Louisiana Legislature, LTRC conducted research to determine the effects that heavy, overloaded sugarcane trucks pose on Louisiana's highways and bridges. As a result of the three-part study, the legislature enacted revisions to the *Revised Statute 387.7. Special permits; vehicles hauling sugarcane.* Researchers recommended that the legislature keep the truck weight allowance at the current level, which is 80,000 lb. However, the newly enacted statute explains that truck drivers who wish to haul sugarcane in the weight class of 100,000 lb. must add a third axle to their vehicle, to better distribute the weight of the load and decrease the strain on the state's pavements.

Under these circumstances, researchers believe the permit fee can be reduced to zero (instead of the current $100 fee), and a tax incentive of $683 can be given to each truck for the conversion.

The results of this project indicated that the pavement damage from each sugarcane truck (without the added axle) with a weight of 100,000 lb. is at about $2,072/year, and the bridge fatigue cost is about $3,500/year. Therefore, the current sugarcane trucks permit fee of $100 per year is not adequate and should be increased to recover these costs. It was also found that the legislature should not consider raising the weight level allowance of sugarcane trucks to 120,000 lb. in the future for any reason because the pavement costs increase by double and the bridge repair costs rise. Moreover, the magnitude of the damage caused by the 120,000-lb. truck makes the risk of bridge damage and even bridge failure too significant to ignore.

This study was recently recognized by the AASHTO Research Advisory Committee (RAC) and was awarded a spot on its 2013 Sweet Sixteen High Value Research Projects list. Each year, RAC collects High Value Research highlights from member states across the nation. These highlights showcase projects that are providing transportation excellence through research.

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LTRC Project No. 03-5P
Evaluating the Effects of Heavy Sugar Cane Truck Operations on Repair Cost of Low Volume Highways

LTRC Project No. 03-2ST
Monitoring System to Determine the Impact of Sugarcane Truckloads on Non-interstate Bridges

LTRC Project No. 09-1ST
Load Distribution and Fatigue Cost Estimates of Heavy Truck Loads on Louisiana State Bridges

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