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LTRC's TTEC Designated as Tier 2 Center

LTRC's Transportation Training and Education Center (TTEC) has been designated to receive a University Transportation Centers Program grant from the Research and Innovative Technology Administration (RITA) of the U.S. Department of Transportation. The designation was made in the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)," signed into law by President George W. Bush on August 10, 2005.

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Studying the Effects of Hauling Timber, Lignite Coal, and Coke Fuel on Louisiana's Highways and Bridges

DOTD Reports to the State Legislature

During the 2004 regular session, the Louisiana Legislature passed Senate Concurrent Resolution 123, urging DOTD to study the laws governing the operation of vehicles that haul Louisiana products in excess of the current legal standard limitation of 80,000 pounds gross vehicle weight (GVW).

Resolution 123 specifically named timber, lignite coal, and coke fuel to be included in the study. Timber is harvested in all but two Louisiana parishes, and forestry products accounted for almost 22 percent of the state's total agricultural production in 2003. Lignite coal is mined at two locations in northwest Louisiana. Coke fuel, a by-product of petroleum processing, is transported to end users by rail cars, ocean-going vessels, barges, and trucks. This project addressed only the trucks that transport coke fuel.

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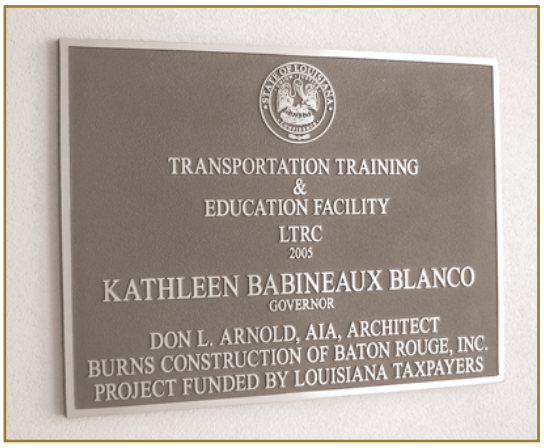
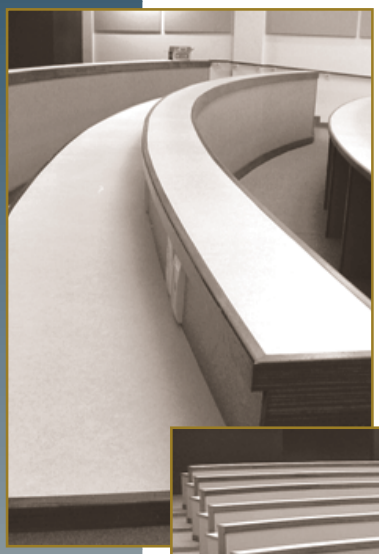
TTEC Receives Tier 2 Funding (cont. from page 1)

The University Transportation Centers (UTC) Program provides grants to operate centers-of-excellence in transportation at institutions of higher learning throughout the country. With grant funds, UTCs conduct research, education, and technology transfer activities to advance the state-of-the-art in research on critical national transportation issues and to expand the work-force of transportation professionals.

The SAFETEA-LU legislation authorizes four years of funding for a UTC at Louisiana State University. The authorized amount of funding to be provided during that time is $500,000 per year, for a total of $2,000,000 authorized over the life of the grant. The authorizing legislation requires the grantee to provide a dollar-for-dollar match on the Federal funding provided under a UTC grant.





"LTRC has worked over several years with Representative Richard Baker's office and LSU's Federal Affairs Division in Washington, D.C.," LTRC Director Joe Baker said. "We would like to thank LSU System President William Jenkins, the DOTD administration, Representative Richard Baker (a senior member of the House Transportation and Infrastructure Committee), and Paul Gravel and Ed Miller of LSU's Federal Affairs Division for their support of this initiative. With this important designation and subsequent funding, TTEC has an extraordinary foundation for providing state-of-the art education and tech transfer opportunities to Louisiana's transportation community."

In August 2004, construction crews broke ground on TTEC, a progressive partnering effort between the public and private sectors of the transportation industry. TTEC will be fully operational by January 2006. For more information about TTEC, call (225) 767-9131 or visit www.ltrc.lsu.edu/ttec.html.

TTEC's auditorium-style classroom

2006 Transportation Engineering Conference Postponed

Due to the impact of Hurricanes Katrina and Rita on DOTD's operations and resources, LTRC announces that the Louisiana Transportation Engineering Conference, scheduled for February 12-15, 2006, will be postponed until February 2007. The date will be announced in *Tech Today* and on LTRC's Web site (www.ltrc.lsu.edu).

Since the conference typically fulfills the PDH requirements for many of our engineers, several single day seminars are being planned throughout the state during 2006 to provide these PDHs.

For more information on DOTD's activities in response to the 2005 hurricane season, visit www.dotd.state.la.us.

Staff Accomplishments

Louay Mohammad, Associate Professor and Engineering Materials Characterization Research Facility Manager, presented a keynote address on the Development, Implementation and Performance of Superpave Mixtures at the Fifth NACOTA China International Transportation Conference held in Chang'An University, Xi'an, Shaanxi, China, June 25 – June 26, 2005 (*picture shown at left)*.

Allison Landry has been named as **LTRC Administrative Manager**. Landry has 10 years of service at LTRC as Administrative Assistant in the Tech Transfer and Training Office.

Keith Beard, Asphalt Research Specialist, was selected to receive the Spring 2005 Employee Education Award from the College of Engineering. This award, created by Dean Zaki Bassiouni, was established to recognize staff members from the college of engineering who have furthered their education at LSU.

Studying the Effects of Hauling Timber, Lignite Coal, and Coke Fuel on Louisiana's Highways and Bridges, cont.

The resolution also requested that the study consider the economic and fiscal impacts to the state and the industry if these loads are permitted to exceed the present legal limitations; examine the adequacy of current special permit fees; and review surrounding states' laws governing the operation of heavily loaded vehicles on highways, roadways, and bridges.

This study began in July 2004 in response to the resolution, which required that DOTD submit a report to the legislature in March 2005. The research team, along with industry representatives, used sound statistical methodologies to select a random sample of roads and bridges. Since transport vehicles hauling timber, lignite coal, and coke fuel can purchase overweight permits (86,600 GVW for log trucks and 88,000 GVW for lignite coal and coke fuel), this study evaluated the highway cost consequences created by permitted vehicles hauling these commodities. Highway costs were generated for three scenarios:

- Vehicles hauling each commodity at 80,000 pounds GVW
- Vehicles hauling at the current overweight permitted load (86,600 GVW for log trucks and 88,000 GVW for lignite coal and coke fuel)
- Vehicles hauling each commodity at 100,000 pounds GVW

Because of the study's time constraints, researchers had to make assumptions to generate information for the study. For example, the accuracy of the pavement cross section data was generally limited to district personnel knowledge about each control section, and the values of subgrade soil resilient modulus required in the overlay design procedure were based on parish charts. Assumptions were also made regarding the traffic volumes included in the control section books. Estimates of timber tonnage hauled were based on information from knowledgeable industry representatives, not actual data taken from mill records.

Control sections carrying timber products by DOTD district

District	No. of control sections carrying timber
2	0
3	120
4	291
5	193
7	66
8	299
58	88
61	175
62	180

The methodology for analyzing the effects of these loads, which was taken from the 1986 AASTHO design guide, involved determining

the overlay thickness required to carry traffic from each GVW scenario for the overlay design period. After differences in the life of an overlay were calculated for different GVW scenarios, overlay thicknesses and costs were determined for a 20-year analysis period. These costs were developed for the sample of control sections included in the study, and the present net worth costs were expanded to represent the cost for all control sections carrying each commodity.

Bridge costs were also considered in this study. The methodology for analyzing these costs was developed by first determining the shear, moment, and deflection induced on each bridge type and span, and then developing a cost to repair fatigue damage for each vehicle passage with a maximum tandem load of 40,000 pounds. After a suggestion from enforcement personnel on the project review committee, researchers performed an additional analysis using one load axle at 48,000 pounds (48 kips), which is the maximum permissible tandem axle load.

The study results show that the provision allowing individual tandem axle loads to approach 48,000 pounds should be eliminated. This provision alone produces annual pavement and bridge damage of over $40 million, with most of the damage to bridges. None of the cost of this damage is currently being recovered through permit fees. As a result, this $40 million annual cost represents a direct subsidy to the timber industry. A review of the pavement and bridge costs could compel the legislature to define the level of subsidy provided to the timber, lignite coal, and coke fuel industries.

In analyzing the effect of the current GVW defined by Louisiana statutes, the research team determined that at the current 86,600 pounds GVW prescribed for timber trucks, the legislature provides a minimum pavement damage subsidy of $346 per vehicle per year for equally loaded axles. This minimum value is based on the assumption that all agricultural harvest permits are log trucks, which is clearly not the case.

In summary, these findings led researchers to recommend the following actions:

- Eliminate the provision that would allow the individual tandem axle load limit to approach 48,000 pounds

- Require equal loading on both the truck and trailer axles

- Increase the permit fee for 86,600 pound GVW harvest permits from $10 to $346/year/truck

When investigating the effect of increasing the GVW to 100,000 pounds, researchers

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High Strength Concrete:
LTRC Investigates Compressive Testing Methods

Over the past two decades, the use of high strength concrete (HSC) has become more common. DOTD has incorporated its use in prestress structural elements used for bridges. Typically, DOTD's HSC has design strength of 10,000 psi minimum. Some have questioned the validity of normal treatments, such as capping compounds and neoprene pads, in HSC testing. LTRC recently completed a research project comparing HSC compressive strengths while using various end treatments.

The current testing procedures call for the commonly used capping compounds to be as strong (compressive psi) as the concrete tested. The four "high-strength" capping compounds commercially available all have compressive strengths in the region of 10,000 psi, which limited their use to concrete strengths of 10,000 psi or less. The use of unbonded caps (neoprene pads with retaining caps and a maximum durometer hardness of 70) is acceptable for concrete strengths up to 12,000 psi. An alternative is to grind the ends of the cylinders to acceptable tolerances for both smoothness/planarity and perpendicularity to the cylinder's sides. This grinding process for each cylinder requires special machinery and is time consuming. This grinding operation is very expensive—$15,000 for the grinder—and requires about 30 minutes of labor per cylinder.

LTRC's research project evaluated the performances of six end treatment systems: four high strength capping compounds, unbonded caps, and ground ends. These six capping systems were statistically evaluated at concrete strengths of 6,000 psi; 8,000 psi; 10,000 psi; 12,000 psi; and 14,000 psi. Fifteen concrete cylinders were tested for each capping system at each of the concrete strength levels for a total of 450 cylinder breaks.

Above: **DOTD uses HSC primarily for bulb-T girders.**
Right: **Typical cylinder capping equipment**

An analysis of variance statistical technique was used to evaluate the six end treatments at each of the five levels of concrete strengths. Coefficients of variation (COV) were also determined for each end treatment. The following results are provided:

- The ground end treatment produced the highest COV while the neoprene pads produced the lowest COV.

- Upon removing the ground ends from the data set, the means from each compressive strength level were found to be similar regardless of end treatment.

- Some of the capping compounds had higher than desired COVs.

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Studying the Effects of Hauling Timber, Lignite Coal, and Coke Fuel on Louisiana's Highways and Bridges (cont. from page 5)

found the added cost of overlays increased by $358/year/truck when compared to current conditions. Bridge repairs increased from zero to $8.90 for each passage of a log truck loaded with maximum tandem load of 48,000 pounds for an estimated annual cost of bridge damage of $3,560/truck. As a result, the project staff recommends that no consideration be given to increasing the GVW from current levels to 100,000 pounds.

These recommendations have been presented to the Louisiana Legislature. For the full text of LTRC Report 398, *Effects of Hauling Timber, Lignite Coal, and Coke Fuel on Louisiana Highways and Bridges,* please visit the publications section of our Web site (www.ltrc.lsu.edu/pubs_final_reports.html).

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Recently Published at LTRC

Research Reports

The following can be viewed at www.ltrc.lsu.edu/pubs_final_reports.html

Report 397: Evaluation of DOTD Semi-Integral Bridge and Abutment System
Authors: Reda M. Bakeer, Norma Jean Mattei, Bashar K. Almalik, Stacey P. Carr, David Homes

Report 399: Statewide Traffic Safety Study Phase I: Review of Current Traffic Safety Research, Practice, Analytical Procedures, and Databases
Authors: Chester Wilmot, Hong Zhang, Haoqiang Fu, Athira Jayadevan, Brian Wolshon, Helmut Schneider, Xiaoduan Sun

Report 403: Determination of Interaction between Bridge Concrete Approach Slab and Embankment Settlement
Authors: C.S. Cai, George Z. Voyiadjis, Xiaomin Shi

Report 404: Alternative Methods to Trench Backfill
Authors: Zhongjie "Doc" Zhang, Mingjiang Tao

Project Capsules

The following can be viewed at www.ltrc.lsu.edu/pubs_projectcapsules.html

Capsule 05-3ST: Development of Advanced Grid Stiffened FRP Tube-Encased Concrete Columns

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