

Technology

Today

Vol 18
No. 3

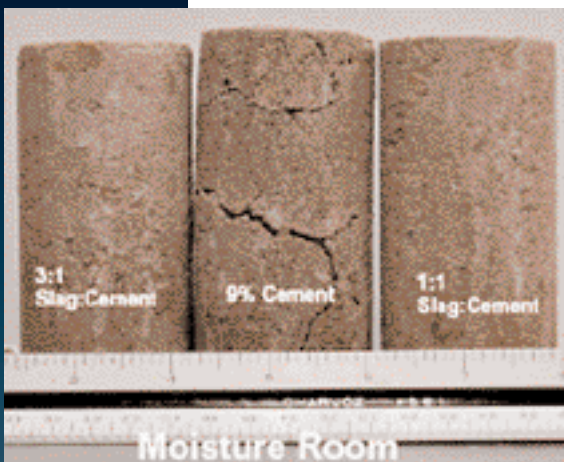
LTRC

2003

A publication of the Louisiana Transportation Research Center

For more information about LTRC, please visit our website at www.ltrc.lsu.edu

LTRC Investigates Stabilization Techniques for Reactive Aggregate Base Courses



Integrity of cementitious material-stabilized Winn Rock containing soil

Winn Rock, a Louisiana aggregate quarried in Winn Parish, has been used extensively in the past by local and parish governments near the quarry for aggregate surface courses on unpaved roads.

LADOTD has also used it for shoulder surface course on some rural highways. As some of these parish roads have been taken into the LADOTD-owned and maintained system, they have

been overlaid with asphaltic concrete or have received asphalt surface treatment as a means of improvement. These roads have now reached a point where rehabilitation is required.

The primary rehabilitation process involves stabilizing the existing base course with Portland cement and constructing an asphaltic concrete overlay. However,

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Rotational Training Program Continues

Since 1991, the Engineering Resource Development Program (ERDP) has been providing new engineers with an invaluable introduction to LADOTD employment. Since the beginning of ERDP 12 years ago, 92

participants have completed the training program. Of these graduates, 61 are currently employed by LADOTD.

Intended to attract and retain new engineers for LADOTD, the ERDP began

Tradition of Success

as a 24-month training program. Today, the rotation is 30 weeks long with an optional two- to six-week extension. New engineers can take part in individual tracks beginning at any time of the year.

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bases containing Winn Rock have experienced heaving after the Portland cement stabilization process. This expansion has often occurred within a day of treatment but may not show up for months. When rehabilitation is necessary, the current solution is complete excavation and replacement.

Under an LTRC-sponsored research contract with LSU, Dr. Amitava Roy has recently completed an extensive laboratory program investigating the properties of Winn Rock. The project sought to:

- Identify the mineralogical properties of soil-cement bases that have heaved or could potentially heave.
- Simulate expansion of cement-stabilized soil in the laboratory.
- Correlate expansion with the micro-structural and mineralogical properties of Winn Rock-containing soil after cementitious stabilization.
- Identify cost-effective stabilization agents for soils that contain Winn Rock.

The research involved a comprehensive laboratory program to analyze mineralogical and micro-structural properties of the expansion. The characterization methods included x-ray diffraction, thermal analysis, and scanning electron microscopy.

Laboratory testing on representative soil from the affected area revealed that Winn Rock experienced both mechanical and chemical weathering over time. The mechanical weathering resulted in the breakdown of the finer size fractions of the soil into smaller anhydrite grains. The chemical weathering led to the formation of gypsum, which was found in significant amounts in all size soil fractions. Ettringite, the other sulfate phase in the soil, was derived from the cement from the previous attempt at stabilization.

Lab simulation of field-observed expansion of Winn Rock-containing soil was accomplished by curing mixes with high cement contents in a high moisture/high temperature environment. Expansion was

caused by the formation of very small ettringite crystals that evolved in size over the first few days.

Because of its higher solubility and much higher dissolution rate than anhydrite, gypsum was the main source of the sulfate necessary for the expansive reactions in the Winn Rock-containing soil. Abundant free calcium hydroxide was also necessary for the expansive reaction.

Cementitious material, including Type I Portland cement, lime, and supplementary cementitious materials such as granulated blast furnace slag (BFS), Class C fly ash, silica fume, and amorphous silica were added to the samples to investigate performance and expansion properties. The addition of a supplementary cementitious material to the cementitious mix reduced the available calcium hydroxide for the reaction, thus reducing the amount of expansion.

The experimental results indicate that cement: BFS mixtures, in 1:1 to 1:3

ratios, can reduce the expansion significantly. While some expansion still occurs, the reduction in expansion is in direct proportion to the amount of BFS. When silica fume or amorphous silica is added to the stabilization mix, no expansion is observed even when cured in a high humidity and high temperature environment.

The most cost-effective mixture of 1:3 cement: BFS produced less than 0.1 percent expansion at 40°C curing in a water bath. The addition of silica fume to this mixture would reduce expansion to below detection limit, but it would also increase the cost of stabilization by 50 percent com-

pared to the blended cement mixtures. The practical application of adding silica fume to the mixture is also a concern.

The research concluded that, instead of pure Portland cement, blended Portland cement and BFS should be used for stabilizing Winn Rock-containing

soil. Field test sections are scheduled for construction by District 08 maintenance personnel to confirm the laboratory results. The first full project using cement/BFS mixture as a solution to the expansion problem will be on US-71, Jct. US 84 - Jct. LA 480, in Natchitoches Parish.



Winn Rock Quarry

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, (225) 767-9145, Louisiana Transportation Research Center, 4101 Gourrier Ave., Baton Rouge, LA 70808-4443.

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Solicitation of Research Problem Statements Underway

If you would like to participate in future research problem solicitations, please contact Harold "Skip" Paul, Associate Director (Research), at (225) 767-9102 or visit the "What's New" section of LTRC's website (www.ltrc.lsu.edu) for more information. The simplified research problem statement form has been sent to all department employees by email and is available on the web site.

LTRC has begun its biennial solicitation of research problem statements.

Although LTRC welcomes problem statements at any time, the problems identified in this process will be the framework for much of the research program's next two-year cycle beginning July 2004. This effort is essential to the successful development and management of an effective LTRC research program.

This process gives LTRC's transportation partners and customers a practical way to make a difference and optimize benefits to the industry. LTRC welcomes both applied and theoretical

problem statements as well as problems that may require technical assistance.

Research Problem Identification Committees (RPICs) comprised of department, government, university, and industry personnel are appointed according to technical or management areas depending on the content of the problem statements. They are tasked to review and prioritize the ideas submitted. Each problem statement is prioritized according to need and implementation potential.

The top-rated problem statements from each RPIC

are again rated and prioritized by the Research Advisory Committee (RAC) comprised of the RPIC chairs and other senior section and district personnel from LADOTD. The RAC then provides a prioritized selection of problems proposed for study.

The individual RPIC committees meet in early December, and each will then send their top two to four problems statements to the RAC for priority rating. Completion of the final prioritized problem list is anticipated by January.

New Video Available on Web Site

"Repair of Existing Roadway Embankments with Non-woven Fabric Reinforcement," a new training video produced by LTRC, is now available for download at www.ltrc.lsu.edu. You can find the video under "What's New," "Downloads," or "Publications" (under Final Reports, Report No. 373).

The video discusses the advantages of using inexpensive non-woven geotextiles to combat embankment slope failure, a recurrent problem for LADOTD maintenance personnel. The demonstration project completed by District 61 at the Blubonnet/I-10 interchange in Baton Rouge is highlighted in the video.

The corresponding final report *Evaluation of the Effect of Synthetic Fibers and Nonwoven Geotextile Reinforcement on the Stability of Heavy Clay Embankments* (# 373) can also be accessed at www.ltrc.lsu.edu under "Publications."

Transportation

Louisiana's Road to Economic Development

2004 Transportation Engineering Conference Plans Progress

Plans for the next Louisiana Transportation Engineering Conference are progressing rapidly. The conference will be held February 15-18, 2004, at the Radisson Hotel and Conference Center in Baton Rouge.

With over 1,400 participants, the 2002 conference was the most successful ever. This biennial conference represents a premier tech transfer opportunity for LTRC, which is charged with the accountability for planning, coordinating, and managing the conference. Attendees represent the public, private, and academic sectors from throughout Louisiana and the nation.

At this time, over 40 technical sessions and several "how-to" clinics are scheduled. The 2004 conference will also include a session about LADOTD employment for civil engineering students from around the state.

Plans for the conference trade show are also underway. The trade show exhibits new materials and equipment from industry consultants and vendors and provides a tremendous networking opportunity. If you have any questions or are interested in participating, please contact John Staring at (225) 612-4181 or jstar@gecinc.com.

The conference home page and online registration, both of which are accessible through LTRC's web site (www.ltrc.lsu.edu), are active. Another new feature planned for the 2004 conference is a CD containing all conference presentations, which will be available to attendees after the conference.

Mark your calendars, and be sure to check upcoming issues of *Tech Today* for regular conference updates.

If you have any comments or questions, please contact:

Planning Committee Chair (overall conference administration)

Kirt Clement, Associate Director, Tech Transfer

(225) 767-9139

KirtClement@dotd.state.la.us



Art Rogers Retires from LTRC Research Staff

After 40-plus years of service to LADOTD, Art Rogers retired from LTRC in August. He began his career in the district construction office in Hammond and then worked for many years in headquarters design. For the past nine years, he has served as the manager for management policy analysis and special studies research at LTRC.

Rogers says he enjoyed his tenure with the department and will miss the family-like atmosphere at LTRC. He and his wife Sylvia live in Hammond and plan to travel some during retirement, including a trip to his wife's home of Newfoundland.

We at LTRC would like to express our appreciation for Art's service over the years and wish him well in his new endeavors.

Engineering Resource Development Program, cont. from page 1

Mike Boudreaux, the ERDP manager, believes that completion of the rotation gives participants an uncommon perspective of LADOTD—one that lets them experience first hand the variety of LADOTD operations. Before beginning a career with LADOTD, ERDP can answer potential employees' "real life" questions in a way that typical job entry preparations cannot. The department also benefits from the new ideas and fresh approaches of the steady stream of new participants.

Although the ERDP is not the only way to get into LADOTD employment, it is the predominant means of entry for new engineers. It is particularly beneficial for recent college graduates who may need hands-on experience before deciding on a career path.

According to Boudreaux, potential participants are evaluated not only for academic achievement but also for interest, enthusiasm, preparation, and diversity, among other things. Currently, enrollment is lim-

ited to 10 people at any one time.

Participants truly do get a taste of all aspects of LADOTD in the 30-week rotation. After an orientation at LTRC, new hires spend one to three weeks in 19 different sections (see table on opposite page).

After completing each section, the ERDP manager provides evaluation forms to supervisors and participants. Supervisors rate the entry-level engineers on issues such as work product, communication skills, adaptability, etc.

Participants evaluate the usefulness of the experience, the effectiveness of the training received, and their interest in that particular area. When an individual completes the rotation, the ERDP manager considers supervisor feedback, the participant's interests, and position availability prior to the participant's more permanent assignment to a particular location.

Barry Lacy was the first person to complete the ERDP. He now works in

headquarters construction. Since he wasn't exactly sure of what area of LADOTD he wanted to work in at that time, he felt the rotational program was a good choice. "Getting to know the people in different sections and knowing who to call when you need something has proven to be the greatest benefit from the program," Lacy said.

John Eggers, Senior Concrete Research Engineer at LTRC, was another one of the first participants in the program. "It was beneficial to learn first-hand what the department's various sections do on a daily basis," Eggers said about the ERDP. "It also provides good communication within the department. When you've been through the program, you'll remember the contacts you've made in the different sections."

A recent participant, Tokesha Collins completed the ERDP in January 2003 and now works in road design. She chose the program because there were no openings in the design sections when she first

applied to LADOTD. “I got a good idea of the dynamics and workload of each section,” said Collins. “At the end when I had to choose a section to work in, I made a truly informed decision. There’s no way that would have happened had I not participated in the program.”

With over 65 percent of graduates still employed by the department, it is evident that the ERDP is fulfilling its mission of recruiting and retaining the best engineers for LADOTD.



This summer, LTRC’s publications and digital media unit unveiled a new look for the web site. Aside from its updated appearance, the site incorporates improved usability features as well.

We invite you to visit www.ltrc.lsu.edu and check out these and other new features for yourself.

- **Drop-down menus and side buttons makes the new site more user-friendly and interactive.**
- **The “What’s New” section will be updated monthly to include upcoming conference information, recently posted publications, new streaming videos, and other news items.**
- **The publications section has been expanded to include complete listings of final reports, project capsules (a brief description of on-going research projects), and technical summaries (a synopsis of findings and recommendations for completed research projects). Technical assistance reports and newsletters will also be posted online.**
- **The Local Technical Assistance Program (LTAP) is now able to offer online registration for its Roads Scholar courses via the web.**
- **The new “Contact Us” section allows users to fill out a form to email comments or questions to LTRC.**

ERDP	
<i>Planning</i>	
Environmental.....	1 week
Data Collection.....	1 week
Statewide Planning.....	1 week
<i>Public Works/Intermodal</i> 1 week	
<i>Materials and Testing</i> 2 weeks	
<i>Design</i>	
Location and Survey.....	1 week
Bridge Design.....	3 weeks
Road Design.....	3 weeks
Contracts and Specifications.....	1 week
Pavement and Geotechnical.....	3 weeks
Hydraulics.....	3 weeks
<i>Headquarters Construction</i>	
District.....	1 week
Laboratory.....	1 week
Traffic Operations.....	1 week
Design.....	2 weeks
Construction.....	2 weeks
<i>Maintenance</i>	
Maintenance.....	1 week
Structures and Facilities.....	1 week
Traffic Services.....	1 week
<i>Optional (2-6 weeks)</i>	
LTRC.....	2 weeks
Information Services.....	2 weeks
Geometrics.....	2 weeks

Loss Prevention Hosts 36th Annual

NAATSHO conference

The 36th Annual North American Association of Transportation Safety and Health Officials (NAATSHO) Conference met in August of this year at the Monteleone Hotel in New Orleans. This year's conference, a great success, was hosted by the Loss Prevention section of LTRC, with Fred Rasmussen, DOTD Loss Prevention Director, playing the lead role in program development.

NAATSHO promotes and improves the efficiency and effectiveness of the occupational safety and health programs designed for the United States, Canadian and Mexican highway and/or transportation departments. Membership consists of the safety and health officials primarily

responsible for directing occupational safety and health programs for their departments.

The annual conference of the association provides a forum for the transfer of new and interesting technologies and innovative practices and provides an opportunity for the exchange of contemporary ideas and practices between represented transportation organizations.

Delegate presentations, outside speakers, and official delegate business meetings filled the conference agenda. An exhibitor room was also available during the meeting. Outside presenters were invited from organizations such as Nissan International, Hepatitis

Foundation International, Coastal Training Technologies, and the Louisiana Assistant Attorney General's office. Some of these speakers dealt with child seat safety, preventing hepatitis through effective communication, computer-based training, and domestic violence as a workplace issue, among other topics.

One of the most popular events of the week was the panel discussion, "Trends in Nighttime Work Zones and Accidents Demand New Approaches." Panelists represented the International Safety Equipment Association (ISEA), Head Lites Corporation, Avery Dennison Corporation, Gehring Textiles, MTS Safety Products, and the FHWA.

