UMR UTC
University of Missouri-Rolla
University Transportation Center
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University Transportation Center
Missouri-Rolla

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DIRECTOR'S message

As any other human activity, the University enterprise can be compared to an endless journey towards success and recognition. The criteria to measure both may vary, but the point is that we strive for something better than survival. One may also argue that the journey is really a race; a race with no finish line, or a tournament with an endless number of teams. Irrespective of the analogy, would it be because we have reached a rest point in our journey, completed a lap in our race, or played a game in our tournament; we can take a second to look at the past, (savor a little bit of our success) and plan for the future. That's where we are today with our University Transportation Center at UMR.

The journey started seven years ago, when the University of Missouri-Rolla was named for the first time in the Transportation Equity Act for the 21st Century (TEA-21) as one of the hosting institutions of this federal program aimed at creating centers of excellence for activities related to research, education, and technology transfer revolving around a specific theme, consistent with the transportation mission of the host and the goals of the federal program. UMR selected "Advanced Material and Non-destructive Testing Technologies" as the area where we could improve the state-of-the-art knowledge and make a significant contribution towards meeting some of the transportation needs of our nation. Two years into the program, 17 of the centers were asked to enter into a competition that would see only ten remain eligible for continued federal support. Needless to say that UMR was among the remaining ten. If members count and give a snapshot of the situation, how can one summarize UMR's performance over seven years? Table 1 given below shares some of the key statistics.

Year	Federal funding ($k)	Non-federal match ($k)	No. of projects
98-99	274	473	19
99-00	262	753	16
00-01	431	979	17
01-02	435	630	19
02-03	916	1,646	25
03-04	906	917	34
04-05	952	2,188	26
Total	4,176	7,586	152

Table 1: seven-year track record of expenditures and projects

In July of this year, Congress passed the Transportation Reauthorization Bill named: "Safe, Accountable, Flexible, Efficient Transportation Equity Act, a Legacy for Users (SAFE-TEA-LU) signed by President Bush on August 10. This time UMR was named as one the ten institutions selected nation-wide to become a National UTC, which translates into significantly more funding, recognition, and accountability. As we firmly believe that this promotion is well deserved and builds on our past accomplishments, we need to recognize the key contribution of Senator Kit Bond and his staff who, with their tireless work and dedication, have made sure that Congress and the nation take notice.

In our next newsletter, I will have the opportunity to present you with our vision for the future. Not that we are sitting idle or we do not know, but if I were to tell you now, you may have no interest in reading this column in the next issue.

My closing remarks go to the newsletter itself. We have recognized the need to reach out four times a year with a small publication, (distributed in electronic format only) to make you aware of what is current. The newsletter is intended to be informal and fresh. We would like to hear back from you and remain interested in including your comments.

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UMR RESEARCHERS APPLY INNOVATIVE FRP REINFORCEMENT SYSTEM FOR ACCELERATED BRIDGE CONSTRUCTION

Greene County Bridge 14802301 Project by Fabio Matta

According to the 2004 National Bridge Inventory (Federal Highway Administration), the state of Missouri has the largest inventory of deficient steel bridges in the country. 5,665 metallic bridges out of the total 23,800 filed are in need of rehabilitation or, in the worst cases, replacement. The major instrument of degradation is by far corrosion of metallic structural members and of steel reinforcement within concrete decks and safety appurtenances, accruing from the routine use of deicing salts on roads and exposure to harsh environments. Increased load requirements further emphasize the need for substantial structural upgrades.

...**"the state of Missouri has the largest inventory of deficient steel bridges in the country. 5,665 metallic bridges out of the total 23,800 filed are in need of rehabilitation"...**

Fig.1 Bridge 14802301, Greene County, MO: extensive degradation of concrete deck (a), safety appurtenances (b), and steel girders (c).

The impact of the economic and social costs of such operations calls for the development of competitive and durable structural systems that can be rapidly installed.

UMR researchers, led by Dr. Antonio Nanni, the V. & M. Jones Professor of Civil Engineering, are applying an innovative, corrosion-free deck and guardrail system to design the new Farm Road Bridge 1482301 in Greene County, MO, to be constructed by the end of 2005. The County opted for the replacement of the seventy-years old bridge, which is currently posted, due to the severe deterioration of the concrete deck, with through-thickness holes up to 1.5 ft of diameter, and of the steel girders, which present top flange thickness loss due to corrosion up to one third of the total (Figure 1).

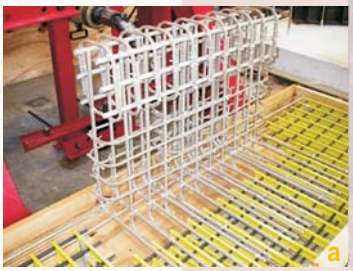
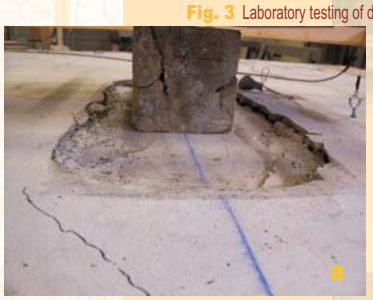


Fig.2 Innovative deck-guardrail GFRP reinforcing system for accelerated bridge construction: pultruded SIP panel with connected guardrail reinforcement (a), and post/overhang subassemblage after casting (b).

The new concrete deck is reinforced with 24 ft by 8 ft GFRP grid panels that also act as stay-in-place (SIP) formwork (Figure 2). Corrosion resistance is provided by the use of GFRP, which stands for Glass Fiber Reinforced Polymer, a material composed of glass fibers embedded in a polymeric resin, stronger and much lighter than steel. The use of lightweight (only 900 lb each), large scale SIP panels is a cutting edge solution to eliminate time-consuming steps such as construction of extensive falsework and tie-in-place of the reinforcing rebars, thereby dramatically improving the speed of installation. An earlier generation of GFRP SIP panels was recently successfully used in a pioneer application in Wisconsin. The new system is complemented by a modified Kansas Corral Rail (Figure 2), designed replacing the traditional steel reinforcement with GFRP prefabricated rebar cages. The post cages will be inserted in the SIP panels, which will then be lifted with a single pick of a crane, and installed over the steel girders. The design, detailing, testing, and construction planning are underway in a joint effort between UMR and its university partner, the University of Wisconsin-Madison (UWM), the Greene County Highway Department, the engineer-of-record (Great River Engineering of Springfield), the contractor (Hartman & Co. of Springfield), and UMR industry partners Strongwell (Bristol, VA) and Hughes Brothers (Seward, NE). Due to the peculiar physical and mechanical characteristics of FRP materials, the design philosophy of FRP reinforced concrete structures is substantially different from that of traditional reinforced concrete. Extensive experimental and theoretical research work have been performed at UMR and UW to characterize the response of the structural system (Figure 3), that largely exceeds the current code requirements.

Fig. 3 Laboratory testing of deck panel at UWM, and of deck/post connection at UMR.



The project was presented to Greene County and the community during a showcase held on April 13 at the UMR Structures Laboratory. A full-scale mock-up of the new bridge section was used to illustrate the main characteristics of the solution proposed, and the research significance of the application. In perspective, the rapid and effective replacement of deficient bridges would provide the community with safer and more durable structures, along with significant cost savings, due to reduced traffic disruption during installation and minimal maintenance needs.

MINORITY STUDENTS TO EXPLORE TECHNOLOGY AND ENGINEERING AT UMR CAMP


Lisa A. Anderson

In 2004, Ms. Anderson envisioned and implemented the idea of having a group of GEAR UP Missouri students participate in a 2-1/2 day camp patterned after the weeklong MITE session. That successful camp, sponsored by GEAR UP Missouri, allowed 33 students and 4 staff to participate in a very enriching experience.

Before her untimely death in January 2005, Ms. Anderson was in the process of planning for 30 or so academically talented students, who will be juniors in the fall of 2005, to participate in a full MITE session as a statewide outreach program to generate more interest in science, technology, engineering and mathematics degrees among traditionally underrepresented student populations.


MITE Summer Institute Camp 2005 Group

In recognition of Lisa Anderson's pioneering effort to hold the first GEAR UP mini camp at UMR last year, we are recognizing this special full session in her honor. The Lisa A. Anderson Minority Introduction to Technology and Engineering (MITE) Summer Institute camp at the University of Missouri-Rolla will take place June 5-10 on the UMR campus.

"The camp is a great opportunity to showcase our well-known science, technology and engineering programs to high school students," says J.P. Fransaw, coordinator of the Minority Engineering and Science Program at UMR. "It will be a very busy week for the students, but they seem to really enjoy the experience."


J. P. Fransaw

According to Fransaw, this is the second year UMR will host the event. This year, he says, the camp has been expanded to a full week.

Approximately 30 high school students from Southeast Missouri and the St. Louis area are expected to attend the camp, which is part of a statewide outreach program to generate more interest in science, technology, engineering and mathematics among traditionally underrepresented student populations.

The MITE students will experience lectures from UMR faculty, participate in hands-on science projects and engineering workshops, participate in academic discussion groups, interact with alumni and staff members, and take tours of campus facilities.

Lisa Anderson, organized UMR's first MITE event, a mini-camp, last year.

"In recognition of Lisa Anderson's pioneering effort to hold the first camp at UMR last year, we will be honoring her during this special full session," says Fransaw.

Those selected to participate in the camp have expressed an interest in pursuing a higher education degree in a science, technology, engineering or mathematics field. High school transcripts are reviewed before students are selected for the camp.

The camp is sponsored by UMR's Center for Pre College Programs, Minority Engineering & Science Program (MEP), University Transportation Center, Phelps County Bank, and the Missouri Gear -Up Program.

51 GIRLS GET INTRODUCED TO SCIENCE AND ENGINEERING AT UMR

Who says girls and women aren't cut out for science or engineering?

July 18-22nd 51 girls from high schools across the nation were on the campus of the University of Missouri-Rolla to participate in UMR's annual Summer Solutions Camp, which is designed to introduce young female students to science and engineering fields.

"We are trying to continue to increase the number of female students in the fields of science and engineering at UMR," says Cindi Vogt, coordinator of UMR's Women in Science and Engineering (WISE) program.

During the camp, students interacted with UMR professionals and got an introduction to various fields of study. The program prepares students for college and also gives them a better understanding of what it will take to pursue engineering or science as a profession, Vogt says.

The girls, who are freshmen or sophomores in high school, came from six states, including Missouri. They experienced campus life during the week, staying in one of UMR's residence halls.

"The girls participated in fun, hands-on learning activities," Vogt says. "They also learned what kinds of jobs, salaries and benefits come with science and engineering. They interacted with professors and current students, competed in team design projects, learned about college admissions and financial assistance, and enjoyed evening socials."

UMR's 2005 Summer Solutions Camp was coordinated by UMR's Women's Leadership Institute and the WISE program at UMR. Sponsors of the camp included UMR and the University Transportation Center.

ORGANIZATIONAL RESULTS: a prescription for performance

...."Our challenge is to focus on research projects that will have the greatest impact on delivering a world-class transportation experience that delights our customers and promotes a prosperous Missouri"...

With a two-letter abbreviation of OR, it's not surprising that Organizational Results Division Director Mara Campbell likens her new unit to a medical staff. "Organizational Results has a relationship with the rest of MoDOT comparable to that of a doctor and patient," said Campbell. "We give the diagnosis, we make a recommendation of how to fix it, but we are not the implementers or the decision makers." Just as it is in the doctor's office, the patient makes the final decisions. "It is up to the various leadership to determine what is actually implemented."

OR was formed June 1, as part of a larger department reorganization. "Our focus is to support and consult department managers in closing performance gaps," Campbell said. "Of course, it all revolves around delivering the 18 tangible results."

In their work, OR is both proactive and reactive. Staff members work daily with department managers to examine performance data to identify and close gaps. Yes, these doctors make house calls. OR is also approached by other departments who may notice a problem and need help to arrive at a solution.

The 21 staff members in OR come from a variety of backgrounds in business and engineering. Campbell is the former manager of strategic planning, which has been integrated into OR. Other staff members come from human resources' employee development and research development and technology. "One of our strengths is the broad experience we can offer," Campbell said. "We can come at a problem from several different disciplines."

One of those disciplines is research. "Our challenge is to focus on research projects that will have the greatest impact on delivering a world-class transportation experience that delights our customers and promotes a prosperous Missouri," Campbell said. "Our approach is dependent upon partnering with public and privates sectors, as well as taking full advantage of best practices and innovation."

Literally hundreds of interviews have been held with MoDOT managers, technologists, practitioners and external research partners to identify potential research topics that could help MoDOT deliver its 18 tangible results. The culmination of this assessment was a daylong brainstorming session with nearly 40 internal and external research partners. A prioritized list of research topics from that session was compared with earlier interviews to produce nine research focus areas. Each of these areas addresses multiple tangible results. Current research was checked for alignment with the vision. Finally, a projected budget was developed to identify funds available for new research over the next five years. Organizational Results staff will share these results with MoDOT management to select specific research projects to conduct. The final product will be a five-year strategic research vision for MoDOT, which should be available on MoDOT's website (http://www.modot.org) in the very near future.

Although the department is still relatively new, Campbell is already looking to the future. "My personal goal is that every MoDOT employee sees that OR is as valuable as any other division," she said. "One year from today, I would hope there would be testimonials from district and division leaders about how OR has helped them improve their performance."

Graduate Research Training in Transportation Areas

With the designation of the University Transportation Center (UTC) at UMR to be a national center, a total of $250K per year for four years is available immediately to recruit eight new doctoral students each year to support research in transportation areas. The objective of this project is to increase the number of students who will pursue teaching and research careers in transportation areas. This project is aimed at graduate research training of students interested in pursuing careers in transportation areas. These students can pursue their doctoral studies in any department at UMR. In departments where a master's degree is the highest degree awarded, students pursuing their master's degree with thesis option will be considered. Areas as stated in the goals, interests and objectives of State Departments of Transportation and Missouri Department of Transportation in particular will be considered for support in this project. In as much as they relate to the stated goals and needs of State DOTs and MoDOT in particular, UMR-UTC will support activities aimed at:

- innovative research in operations, materials, design, safety, security, policy, management, finance and economic development as it relates to the transport of people and goods in all modes;
- education of future transportation professionals; and
- transfer of research results into practice.

This program will be administered by the Associate Dean for Graduate Affairs in the School of Engineering Dean's Office. The School of Engineering Graduate Affairs Committee will select the students to be supported under this program. For more information, please visit: http://soe.umr.edu/utcgra.html