



The Innovative Engineer

“Innovative Engineering Against Hazards”

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A Word from the Director

by Dr. Kevin C. Womack

Our first year as a Tier II University Transportation Center has been an eventful one. The first half of the year involved cementing our relationship with the Utah Department of Transportation, and collaborating with them on several projects. These projects were described in our first newsletter, and are listed on the back page of this newsletter under “Center Projects in Progress.” As we move forward we expect to see this list expand.

The second half of the year had two very exciting highlights. The first was the development of a research relationship with the Utah Transit Authority (UTA). This is a great move for the Center in two ways. First, it expands the Center’s efforts into the transit area and, second, it engages colleagues from a department outside of Civil Engineering. In meeting with UTA leaders it became very obvious that most of their needs are in the information technology area. As a result of this we invited several faculty from the College of Engineering’s Electrical and Computer Engineering (ECE) Department to meet with UTA staff. The results of this effort is one research project near completion, a study on providing broadband wireless service on the FrontRunner commuter rail between Salt Lake City and Ogden, scheduled to begin service in the spring of 2008; and a second one to start soon on using Lidar technology to count passengers on buses. This budding relationship with UTA is very exciting and we look forward to working with them in many areas of transit research.

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Center Expertise Tapped in Aftermath of Minnesota Bridge Collapse

Following the tragic collapse of the I-35W bridge in Minnesota in August, Congress and the nation as a whole are taking a fresh look at what needs to be done to keep this from happening in the future.

To that end, Dr. Kevin C. Womack, Director of the Utah Transportation Center and chair of the American Society of Civil Engineers Transportation Policy Committee, was asked to testify September 19, 2007 in Washington, DC before the House Committee on Science and Technology hearing on bridge research and safety. This testimony was based on his extensive experience as a structural engineer and more particularly his involvement in the area of bridge research for the past 15 years.

In the words of House committee chairman, Bart Gordon (D-Tennessee), the bridge collapse was a “wake up call that we need to be doing more to strengthen our bridges now and for the long term.”

Dr. Womack, in his testimony pointed out that “like all man-made structures, bridges deteriorate.” He continued by saying that, “deferred maintenance accelerates deterioration, which may make bridges more susceptible to failure. As with critical infrastructure, a

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*Investment, research,
professional expertise and
implementation of new
technology emphasized during
testimony before House hearing
on bridge research and safety.*

significant investment is essential to maintain the benefits and to assure the safety that society demands.”

In addressing the topic of infrastructure investment, Dr. Womack additionally emphasized the importance of investment in research. He stated that, “there is a need to study long term bridge life to develop a better understanding of how bridges age and deteriorate.” The benefit of this research investment is that it would allow researchers to “better predict and model bridge behavior and could lead to improved maintenance practices and better bridge management.”

One suggestion made by Dr. Womack regarding the issue of safety is that “inspection is the crux of this issue.” He stated that, “a more clearly defined inspection protocol should be developed, through research, that goes beyond visual inspections to testing and monitoring that includes instrumentation.” Any new protocol, “must be as objective as possible, with no doubt as to what steps are to be taken and when.” He pointed out that, “one way to make visual inspection less subjective is to have them done by licensed professional engineers and not by technicians.” At the very least, technicians who inspect bridges will need extensive training, and have clear guidelines to direct the inspection procedure in order to assure safety for the traveling public.

Another way that bridge safety can be expanded is through the use of innovative technology. Dr. Womack encouraged the Federal government to, “do more to encourage states to use new technologies, without requiring the states to assume all the risk.” He mentioned the FHWA Innovative Bridge Research and Deployment program as one that, “needs to be expanded and monitored to ensure that these funds actually go toward proving new technologies.”

At the conclusion of Dr. Womack’s remarks, he urged Congress to act, stating that, “for the safety and security of our families, we, as a nation, can no longer afford to ignore [the] growing [infrastructure] problem...without action, aging infrastructure represents a growing threat to public health, safety, and welfare, as well as to the economic well-being of our nation.”

Following up on his testimony before the House, Dr. Womack noted that the expertise of University Transportation Centers, like the Utah Transportation Center, can be a valuable resource and investment in providing the research, preparing tomorrow’s professional expertise and developing the innovative technology so critical to safeguarding our nation’s infrastructure.

This expertise can be used in many ways, particularly:

- to help define and conduct the research that will provide a better understanding of both short- and long-term bridge life,
- to develop and test cost-effective and safety conscious bridge building and repair materials and techniques, and
- to develop guidelines and training materials to ensure quality, professional inspection for bridges nation-wide.

Together with the Federal Highway Administration, state departments of transportation and professional associations and organizations around the country, the Utah Transportation Center and other University Transportation Centers will be the partners that are in the best position to take the needed steps to safeguard the traveling public now and in the future.

The Utah Transportation Center already has projects focused on bridge safety with an eye toward earthquake stresses, including projects under the direction of Dr. Marvin W. Halling and Dr. Keri Ryan. With this expertise already part of the Utah Transportation Center, it is expected that additional projects and parameters concerning general bridge safety and systems will be added in the future as the nation comes to more fully understand the need to care for our aging infrastructure systems.

Meet Center Colleague Dr. Marvin W. Halling



It was my privilege to interview Dr. Marvin W. Halling regarding his work with the Utah Transportation Center and his role as associate director of the Center. In visiting with Dr. Halling, I was struck by just how far research has already gone in utilizing technology for the benefit of society.

Dr. Halling, as a structural engineer in Utah, is very aware of the impact of earthquakes on structures. But in the past few years, he has migrated from a purely earthquake emphasis to a more broad look at structural health. This is no more evident than in his current research project, “Real Time Health Monitoring of the 21st South Overpass.” This project has converted a seismic instrumentation package into use as a real-time web-based vibration monitoring system. The data gathered through this instrumentation is a key part in monitoring the structural health of this bridge as well as aiding in overall damage detection. It is expected that the data gathered through this monitoring will prove critical in helping determine the health of this bridge before and

after a damaging event. This is a critical step toward a future of “smart structures” that will help monitor themselves and provide data on their own health, allowing for more efficient use of resources in safeguarding our nation’s infrastructure. Dovetailing with this project is work Dr. Halling is doing with Center colleague, Dr. Paul Barr, on other areas of structural health.

Dr. Halling has been a part of the Civil & Environmental Engineering faculty at Utah State University since 1994 (currently serving as Associate Professor and Head of the Structural Division), but he is not a newcomer to Utah State. In fact, he received his BS degree in Civil Engineering from USU in 1985. This was followed by his MS degree from Stanford in 1986. He was awarded his PhD from CalTech in Applied Mechanics (with a minor in geophysics) in 1995. He is a member of the ASCE Seismic Effects Committee, ASCE Structural Health Monitoring Committee and the TRB ASF40 Dynamics and Field Testing of Bridges Committee as well as serving as an Associate Editor of the ASCE Journal of Structural Engineering. He is a licensed professional engineer in both Utah and California. Dr. Halling can be reached by e-mail at marv.halling@usu.edu.

Utah Transit Authority Project Underway

With the opening of the FrontRunner commuter rail in the spring of 2008, the Utah Transit Authority (UTA) is looking to attract riders by making uninterrupted internet service available on these trains. The goals of this project, known as the “River of RF Project,” are to assess various technological options available to provide wireless broadband service on the commuter rail trains. This involves identifying and evaluating a realizable wireless architecture capable of handling large volumes of voice, video and data communications. Preliminary results of the study point to WIMAX backhaul as the most attractive option. The next step will examine specific wireless products and their deployment potential on the train. The principal investigator for the project is Dr. Chris Winstead, with co-PI’s Drs. Jake Gunther and Brandon Eames, all of the Electrical and Computer Engineering Department at Utah State University.

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The second highlight of the past few months was the opportunity that I had to testify before the House Committee on Science and Technology, on September 19th. The title of this hearing was “Bridge Safety: Next Steps to Protect the Nation’s Critical Bridge Infrastructure” (see article, front page). I was invited to testify at this hearing as the Chair of the ASCE National Transportation Policy Committee, Director of the Utah Transportation Center, and a bridge researcher. It was an absolutely wonderful experience, not only for myself, but it put to the fore the importance of research and the role that University Transportation Centers can play in the important issues of the day.

For comments or questions, please feel free to contact me at Kevin.Womack@usu.edu. Thank you.

Find us on-line at:

<http://transportation.usu.edu>



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Center “Projects in Progress”

*These projects are co-sponsored and funded by
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- Strong Motion Instrumentation Plan for UDOT Bridges: Array Design, Typical Details, and Specifications (PI: Dr. Marvin W. Halling)
- UDOTs Calibration of AASHTO’s New Prestress Loss Design Equations (PIs: Dr. Paul J. Barr and Dr. Marvin W. Halling)
- Evaluation of Bridges for Seismic Retrofit (PI: Dr. Keri Ryan)
- Failure Modes Analysis of UDOT’s MSE Wall Inventory (PI: Dr. James A. Bay)

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