ODOT Research News

Spring 2006

ODOT Research News

NORTHWEST TRANSPORTATION CONFERENCE

The 2006 Northwest Transportation Conference was held February 7-9, at the Oregon State University CH2M-Hill Alumni Center in Corvallis. The conference theme was ***Road Ecology: Surface Transportation and the Environment***. In line with that theme, there were sessions on: transportation and land use, historic highway preservation, pavements, structures, alternative and bio fuels, geotechnical hot spots, local road maintenance, wild life crossings and habitat connectivity, road pricing, update of the Oregon Transportation plan, and a session on the new Oregon Temporary Traffic Control Handbook. There were also several sessions organized by ITS Oregon featuring aspects of Intelligent Transportation Systems technology.

Several guest speakers attended the conference, including: Grace Crunican, Director of the Seattle Department of Transportation; Gordon Price, adjunct professor of urban planning at the University of British Columbia; Gary Spanovich, Parsons Corp.; Ken Williamson, Oregon State University; and Richard Forman, Harvard Design School.

Luncheon speaker, Richard Forman of the Harvard Design School, speaking on road ecology

The conference also included a panel discussion about the new Oregon National University Transportation Center (UTC). The panel included representatives from Portland State University, Oregon State University, University of Oregon, and the Oregon Institute of Technology.

Sponsors for the conference included: the Oregon Department of Transportation, the OSU Kiewit Center for Infrastructure and Transportation, Oregon Technology Transfer Center, ITS Oregon, Association of Oregon Counties, Federal Highway Administration, and many others.

Presentations from the conference are available through the ODOT Research Unit web site. Presentations are organized based on the conference agenda and may be found at: http://www.oregon.gov/ODOT/TD/TP_RES/docs/2006_NWTC/2006_brochure.pdf

The conference was well attended this year, attracting transportation professionals from state and local government, and the private sector. The next conference is planned for February 2008.
For more information contact Barnie Jones at 503-986-2845.

Opening session of the conference. From left to right: Grace Crunican, Director of Seattle DOT; Barnie Jones, ODOT Research Manager; Matthew Garrett, ODOT Director; and Gary Spanovich, Parsons Corp. Speaking at the podium is Jim Lundy, Dean of the OSU College of Engineering.

Some of the vendor displays at the conference

RESEARCH OPPORTUNITIES IN THE SAFETEA-LU TRANSPORTATION REAUTHORIZATION BILL

The Federal Transportation reauthorization bill, passed in August of 2005, provides a commitment of resources through Federal Fiscal year 2009. Because transportation projects have multi-year time horizons, Congress enacts transportation authorization bills usually for six year periods, giving transportation agencies the ability to make multi-year financial commitments. The previous reauthorization, known as TEA-21, expired at the end of Federal FY 03, but Congress was unable to pass a replacement until the end of July, 2005, almost two full years into the current FY 04-09 period. However, the new authorization did invest very heavily in transportation research. The following focuses on the research components of the bill.

CTS Executive Committee members Marc Schlossberg, Chris Higgins (for Jim Lundy), Barnie Jones, Roger Lindgren, Rob Bertini

University Transportation Research

There has been a Federally funded University Transportation Center (UTC) program since the mid 1980s. These centers have a mission of education and research in transportation. For many years, Oregon universities have participated in Transportation Northwest, the Federal Region 10 UTC housed at the University of Washington. SAFETEA-LU greatly expanded the UTC program, to a total of 60 Centers, 10 of which are newly designated National UTCs, funded at $16 million over the life of this reauthorization.

Of most interest and benefit to ODOT is that one of the new National Centers is in Oregon - the Center for Transportation Studies (CTS) - housed and administered at Portland State University, but also including transportation researchers and educators at Oregon State University, University of Oregon and Oregon Institute of Technology.

Historically, ODOT has contracted with Oregon universities for a large portion of research. In the future, ODOT should expect a number of both short- and long-term benefits. In the short run, many projects which would have previously been funded entirely by ODOT, will now be funded jointly by ODOT and the Center for Transportation Studies. This will allow ODOT to do significantly more research with the same commitment of resources. There may also be important new short-term opportunities to address training and educational needs of ODOT employees.

In the longer term, it should be expected that Oregon universities will develop a much stronger focus on transportation research and education. For more information visit the CTS Website at http://www.cts.pdx.edu/

SHRP II

SAFETEA-LU creates a number of new transportation research programs. Perhaps the most important is the second Strategic Highway Research Program, or SHRP II, which will be administered by the Transportation Research Board in consultation with the US DOT and AASHTO (American Association of State Highway and Transportation Officials). The original SHRP Program was carried out during the 1990s, and among other things, led to the current SUPERPAVE system for asphalt pavement mix design. What SHRP I and II have in common is that both are large research investments intended to make significant scientific advances in resolving major highway transportation problems over a clearly limited period of time.

However, the particular focus of SHRP II is entirely different from that of SHRP I. SHRP II will focus on the following four areas:

- renewal of aging highway infrastructure;
- preventing or reducing the severity of highway crashes by understanding driver behavior;
- reducing highway congestion through incident reduction, management, response and mitigation; and
- planning and designing new road capacity to meet mobility, economic, environmental, and community needs.

SHRP II will be managed by the Transportation Research Board. Barnie Jones, the ODOT Research program manager, will serve as ODOT's point of contact for the SHRP II program.

Other Research Oportunities

SAFETEA-LU also creates and funds several new Cooperative Research Programs. The largest is the *Surface Transportation Environmental and Planning (STEP) Cooperative Research Program*, which will improve understanding of the complex relationship between surface transportation and the environment. In addition, there is a National Cooperative Freight Research Program, funded at $3,750,000 annually, and a small Hazmat Cooperative Research Program.

Finally, SAFETEA-LU funds grant programs in a number of areas that could prove to be of interest to ODOT. Some of those include the Innovative Bridge Research and Deployment Program and the Technology Deployment Program, which will offer grants in a number of areas of potential interest to ODOT. For more information contact Barnie Jones at 503-986-2845.

2007 Project Selection Process

Each year, the ODOT Research Advisory Committee (RAC) prioritizes a slate of research projects to begin during the following fiscal year. The project selection process began last fall when ODOT Research solicited problem statements from ODOT and other transportation interests.

As problem statements were received, they were sorted and assigned to one or more of eight general subject matter areas, handled by Expert Task Groups (ETGs).

More than 120 "stage one" problem statements were reviewed and prioritized by the ETGs, and 31 were recommended for further development as "stage two" problem statements. During the RAC meeting on March 17, the 31 stage two problem statements were reviewed and prioritized.

The selection process for FY 2007 is different from past years due to the creation of the new Oregon University Transportation Center (UTC), which will receive federal funds for transportation research. Most of the problem statement received by ODOT will also be submitted for funding consideration to the UTC. By matching ODOT funds with UTC funds, ODOT Research will be able to stretch its dollars further. The number of projects undertaken by ODOT Research in FY 2007 will thus be based on the RAC ranking and the outcome of the UTC project selection process.

The following is a list of the top twelve stage two problem statements, as prioritized by the RAC.

- Statistical Analysis of QC/QA Data on Construction Projects
- Evaluating the Effectiveness of the Safety Investment Program (SIP)
- Environmental Durability of Fiber-Reinforced Composite Repairs for Diagonally-Cracked Reinforced Concrete Bridges
- Determining Localized Anode Condition to Maintain Effective Corrosion Protection
- Waterway Enhancement Construction Methods
- Assessing the Full Socio-Economic Effects of Vehicle Mileage Fees
- Instrumentation for Mechanistic Design Implementation
- Rainfall Analysis
- Evaluation of Mandatory Reporting of Functional and Cognitive Impairments
- Freight Performance Measures: Approach Analysis
- Access Management Best Practices Manual
- Identify and Address Institutional Barriers Delaying Incident Clearance

Projects selected for funding will be scheduled to start at the beginning of fiscal year 2007.

For more information on the project selection process and other research currently in progress, visit the Research Unit Web site.

Testing Cracked Cross-Beams

Many of Oregon's older reinforced concrete bridges are showing their age with cracks; not only in the girders, but also in the cross-beams that hold up the girders. Nationally recognized research funded by ODOT and conducted at Oregon State University has provided the basis for ODOT to improve its load rating protocol for bridges with cracked girders. However, the research could not be applied directly to cross-beams, because cross-beams are shorter and deeper than girders and very likely behave differently than girders. A research project currently underway at OSU will tell ODOT how much capacity cracked cross-beams are expected to have.

The research is using full-size specimens to mimic vintage cross-beams as closely as possible. Each beam stands on partial columns and is loaded directly on stub-girders, where the main girders would intersect the beam. Up to fifty sensors are attached to the internal steel reinforcement and to the surface of the specimen to measure strains and movement while the specimen is loaded. The specimens are so large they must be built in place within the test frame, tested to failure, and then removed in pieces after the test.

The first specimen was built to incorporate the most common of the worst detail conditions found in actual bridges, such as large utility holes through the beam and steel reinforcement without hooked ends. The specimen was loaded initially to establish cracks typically observed in the field, and then the beam was incrementally loaded and unloaded. After each load increment, the load was removed and cracks were mapped. After eight hours and 1,000,000 pounds, the cross beam finally failed.

The initial results indicate that even with poor detailing, cracked cross-beams should retain plenty of capacity. Additional specimens will be tested to fully understand the behavior of cracked cross-beams, which will provide a means to accurately estimate the capacity of these critical structural elements.

For more information contact Steve Soltesz at 503-986-2851.

An Enhancement to Oregon DOT's Crash Reduction Factors List

Developing a transportation system that balances safety, mobility, and efficiency is a primary objective of transportation agencies, and most will identify safety as a top priority. Nearly every state has a highway safety improvement program and typical approaches to highway safety improvement include:

- Identification of hazardous roadway locations;
- Identification of related roadway design problems;
- Identification of potential countermeasures;
- Assessment of the costs and benefits of potential countermeasures;
- Implementation of countermeasures with the highest net benefits; and
- Assessment of countermeasure effectiveness following implementation.

Identification and implementation of countermeasures are keys to safety improvement planning. The estimated economic benefits clearly depend on projected crash reductions from each countermeasure. These projections are called crash reduction factors (CRFs). They are used by many states, including Oregon, as a tool to evaluate the cost-benefit relationships between various roadway improvements and their effectiveness in reducing crashes and/or reducing the severity of those crashes.

ODOT recognized a need to compile and present countermeasures in a way that would make it less cumbersome for ODOT engineers and planners to search for applicable countermeasures for a given situation, and to have a greater degree of confidence in the CRF described.

A team lead by Robert Bertini at Portland State University undertook this project and has recently delivered an improved categorization scheme of approximately 94 countermeasures. A web-based structure was created which provides easy access to a summary of the existing research and where applicable, the effectiveness of each countermeasure where credible research is available. The database is clearly documented for easy updating as new research is published.

The CRF web interface will soon be based at the ODOT website, but for now it can be seen at its temporary location: http://its.pdx.edu/CRF/CRFweb/

For more information about this project, contact Mark Joerger at 503-986-3464.

Research Project Leads to Improved Asphalt Designs

The Oregon Department of Transportation and the Research Unit have been performing a series of research projects designed to provide input parameters for a new mechanistic – empirical pavement design methodology. The latest project, Mix Characterization Using Dynamic Modulus and APA Testing, was recently completed. The objectives of the research were to establish dynamic modulus values for typical asphalt mixes used in Oregon, and to determine if the APA (Asphalt Pavement Analyzer) device is capable of identifying Oregon mixes that are prone to permanent deformation.

The final report summarizes two research efforts related to asphalt mix characterization. One phase of the research consisted of a laboratory-based evaluation of dynamic modulus of Oregon dense-graded hot mix asphalt mixes. Gyratory compacted specimens were prepared using a single aggregate source and gradation, and four binder grades. After coring and sawing, specimens were tested following AASHTO TP 62-03. Differences in mix design versus field compacted air voids were investigated for typical surface-course mixes and mixes proposed for use in rich base-course mixes in long-life pavements. Master curves were developed for all combinations (sixteen) and made available for ODOT pavement design engineers. Laboratory results did not compare well with the dynamic modulus values predicted using the regression-based equation available in the NCHRP Project 1-37A final report.

The second phase of the research evaluated Asphalt Pavement Analyzer test results on six ODOT projects that exhibited premature permanent deformation. For three of the six projects, suitable aggregates and binder were available to replicate the field mixes. Results were mixed, but it appeared that a 5.0 mm limiting criterion may be suitable for the mix design phase of mix evaluation. Additional testing was recommended.

The results of the project are being incorporated into the ODOT New Work M-E procedure and will also be used in the implementation of the NCHRP 1-37A (AASHTO) design guide for the Design of Pavement Structures. The new guide will be used for both new work and pavement rehabilitation.

For more information about this project, contact Norris Shippen at 503-986-3538.

PSU TRANSPORTATION SEMINARS
NOW AVAILABLE FOR DOWNLOAD

The Center for Transportation Studies at Portland State University has been hosting weekly Friday transportation seminars for the past several years. The seminars are open to students, faculty, transportation professionals, and the public. The topics are wide-ranging, including: safety, congestion, traffic management, transit, modeling, ITS, parking, freight movement, land use, finance, planning, and pedestrian and bicycle issues. For the full weekly seminar schedule, see the PSU Center for Transportation Studies web site: http://www.cts.pdx.edu/seminars.htm

The seminars are held from 12:00 noon to 1:00 p.m. in Room 204 of the Urban Center at PSU. The Urban Center is located in the block between 5th and 6th Avenue, and Hill and Montgomery Streets. The seminars are open to any ODOT staff wishing to attend.

To make the seminars more accessible, they are webcast in a streaming video format, and past seminars are also archived. Due to network limitations, though, ODOT employees have not been able to view the live streaming video or the archived video stream. Now, to make the past seminars more accessible to ODOT, PSU is providing the video files for download as well as in streaming video format. You may view a video archive file in either of two ways:

- Left-click the "Download" link and the file will open and play in Windows Media Player; or
- Right-click the "Download" link, select "Save Target As…" and indicate a location to save the video file. Then view the file in Windows Media Player.

Archived seminars currently available for download go back to the Fall 2004 term at PSU. Eventually all seminars back to Fall 2002 will be available in this way. For more information, contact Alan Kirk at 503-986-2843.

SPRING 2006 SEMINAR SCHEDULE

Date	Seminar Topic	Speaker
Apr 7	Motorcycle Safety: An Oxymoron with an Attitude	Steve Garets, Director, Team Oregon
Apr 14	Optimal Mass Transit Subsidies	*Kennith A. Small, Professor of Economics, U.C. Irvine
Apr 21	Zoned Out: Regulation, Markets, and Choices in Transportation and Metropolitan Land Use	*Jonathan Levine, Chair and Associate Professor of Urban and Regional Planning, University of Michigan
Apr 28	ODOT Traffic Impact Analysis Study	Jay McRae and Darren Muldoon, CH2M Hill
May 5	Neighborhood Traffic Calming: From Investigation to Implementation	Kevin Chang, King County Department of Transportation
May 12	Designing Oregon's Road User Fee Pilot Test	Jill Pearson, Road User Fee Pilot Project Manager, Oregon Department of Transportation and David Kim, Department of Industrial and Manufacturing Engineering, Oregon State University
May 19	Columbia River Crossing Environmental Impact Statement	Doug Ficco, CRC Project Co-Director, Washington State Department of Transportation and Jay Lyman, Consultant Team PM, David Evans and Associates, Inc.
May 26	TBA	PSU Students
Jun 2	Developing a Sustainability Program for ODOT	Damon Fordham, Oregon Department of Transportation
Jun 9	Planning for Transportation Operations in the Portland Region	Jonathan Makler, City of Portland and Metro

** Denotes speaker sponsored by Oregon Department of Transportation Visiting Scholar Program*

RECENTLY PUBLISHED REPORTS (click on underlined items for electronic reports)

Asphalt Mix Characterization Using Dynamic Modulus and APA Testing FHWA-OR-RD-06-09

This final report summarizes two research efforts related to asphalt mix characterization: dynamic modulus and Asphalt Pavement Analyzer testing. One phase of the research consisted of a laboratory-based evaluation of dynamic modulus of Oregon dense-graded hot mix asphalt mixes. The second evaluated Asphalt Pavement Analyzer test results on six ODOT projects that exhibited premature permanent deformation.

Evaluation of Inlaid Durable Pavement Markings in an Oregon Snow Zone FHWA-OR-DF-06-10

This project evaluated the use of inlaid durable pavement markings within an Oregon snow zone. Three different durable pavement marking products were installed and evaluated. The inlaid slot depths and the thickness of the materials were varied to achieve different recesses from the surface of the pavement. The test sections were evaluated after each winter maintenance season for durability and retroreflectivity.

NEW RESEARCH NOTES (click on underlined items for electronic reports)

Defending the Coast with Dynamic Revetments RSN 06-04 (December 2005)

Many portions of Oregon's coastline are subject to erosion due to wave action. This natural evolution of the shore becomes a problem when highways or other structures have been constructed close to the shore. ODOT worked with the Oregon Department of Geology and Mineral Industries to conduct research aimed at eventually using dynamic revetments to protect the coast highway and its bridges.

Who Doesn't Wear Seat Belts? RSN 06-05 (January 2006)

Oregon has one of the top rates of seat belt usage in the United States. The reported seat belt compliance rate for 2005 was 93.3%. With such a high compliance rate, it is becoming difficult to identify the remaining population of drivers who do not wear their seatbelts. Oregon crash record entries were matched with DMV driver records to allow for the comparison of seat belt wearing to determine who does not wear seat belts in Oregon.

Monitoring the Health of Bridges RSN 06-06 (February 2006)

Oregon has hundreds of decade old reinforced concrete bridges with large cracks in the concrete. Research at Oregon State University provided ODOT with better analytical tools for determining the safe load capacity of cracked bridges.

Clearing up the Benefits of Chitosan Flocculant RSN 06-07 (March 2006)

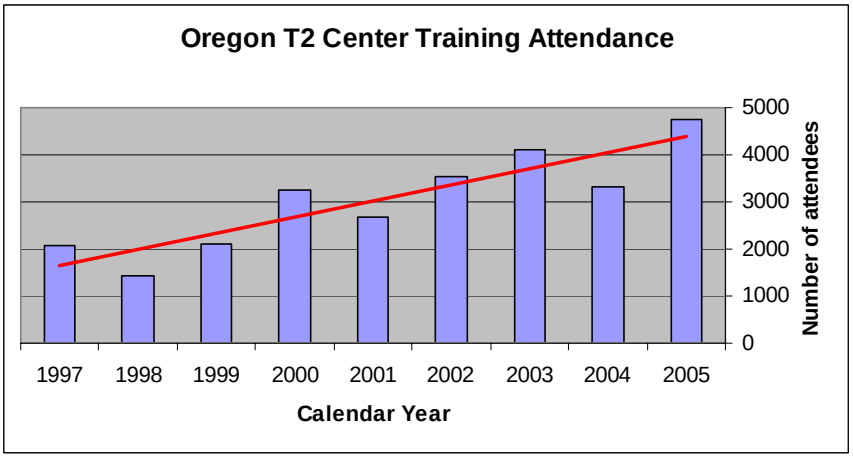
Highway construction and maintenance activities conducted directly in streams disturb soil and rock in the stream bed, creating turbidity. The intent of this project was to test the effectiveness of reducing construction generated turbidity by using a substance called chitosan. By flocculating soil particles together, chitosan causes them to settle out of the water more quickly, or to be more easily removed through filtration.

T2 CENTER

The Research Unit also manages the Technology Transfer (T2) Center, which provides resources for local governments on transportation, particularly roads, streets and bridges. The center offers training through its *Roads Scholar* and Circuit Rider programs. In addition to training classes, the center also publishes a quarterly newsletter, distributes or loans publications and videos, and provides technical assistance to customers.

Funding for the T2 Center is provided by the Federal Highway Administration, under the Local Technical Assistance Program (LTAP), as well as from the cities and counties of Oregon, and ODOT. Since the center is supported in part with federal funds, an annual report to FHWA is required. That report is in two formats, a qualitative evaluation referred to as a Center Assessment Report (CAR) and a quantitative evaluation referred to as a Program Assessment Report (PAR). The Oregon T2 Center, as well as the other 57 LTAP Centers submitted both the CAR and the PAR to the FHWA in January.

The PAR provides some insight into the level of service that the T2 Center provided to Oregon local transportation agencies over the preceding calendar year. In the 2005 PAR, the center reported that it loaned out 106 videos, provided over 18,500 technical publications, and documented at least 1,700 instances where customers were provided technical assistance on transportation related subjects. The 2005 PAR also reflected that the Center provided 164 training sessions covering 30 different topics, to over 4,742 participants resulting in 26,408 contact hours of training. The center hopes to continue the upward trend in the number of students it reaches with the help of local agencies, and through partnering efforts with ODOT and other organizations such as the Oregon Chapter of the American Public Works Association.



Additional information is available on the T2 web site at www.oregon.gov/ODOT/TD/TP_T2/. The current issue of the *Oregon Roads* newsletter, as well as past issues, are also available on the web site, providing the latest in T2 news. For more information contact T2 Center Director Bob Raths at 503-986-2854 or by e-mail at Bob.Raths@odot.state.or.us, or T2 Assistant Beth Hunter at 503-986-2855 or by e-mail at Beth.Hunter@odot.state.or.us

Oregon Department of Transportation
Research Unit
200 Hawthorne SE, Suite B-240
Phone: 503-986-2700
Fax: 503-986-2844
Email: Deborah.A.Martinez@odot.state.or.us

What can we do for you?

Let us help you! Do you have a transportation-related problem that you think could be addressed through research? Need help in locating current research on an issue? The Research Unit may be able to help. We are available year-round to help answer transportation-related questions.

We often answer information requests from ODOT staff by locating technical references, conducting literature searches, or conducting a research project.

Check Us Out!
www.oregon.gov/ODOT/TD/TP_RES/