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Northwest Transportation Conference

The 2010 Northwest Transportation Conference will be held at Oregon State University on February 9th, 10th, and 11th. The theme for the Conference is **The Future of Transportation is Here**, which speaks to the major shift nationally and within Oregon, with regard to energy, climate change and transportation technology.

The conference will open with futurist **Glen Hiestra**, who will explore topics such as the impact of climate change, the integration of land use and transportation, and the electrification of the transportation system.

The 2010 Conference will include both opening and closing plenary sessions, as well as sit-down luncheons on Tuesday and Wednesday, and will feature the following speakers:

- **Scott Belcher**, President and CEO of ITS America.
- **John Charles**, President and CEO of Cascade Policy Institute.
- **Carlos A. Schwantes**, Professor, University of Missouri, St Louis.
- **Richard Willson**, Professor, California State Polytechnic University, Pomona.

Additionally there will be 22 breakout sessions, featuring over 100 speakers. The presenters will discuss a broad diversity of transportation topics. Included will be a number of theme related topics, such as: intercity passenger rail, vulnerability of Oregon coastal infrastructure to tsunami, congestion pricing and green highways. Also, there will be four sessions on ITS topics (sponsored by ITS Oregon).

When: February 9-11th, 2010

Where: CH2M Hill Alumni Center at Oregon State University in Corvallis, OR

Cost: \$300 for all three days, \$175 for Tuesday + Thursday or Wednesday + Thursday

Website/Registration: <http://kiewit.oregonstate.edu/nwtc>

Repair Methods for Cracked Girders and Cross Beams

Oregon has many older reinforced concrete bridges still in service. These bridges were designed according to the standards of their time, which were not as stringent as today's requirements. Since they were constructed decades ago, these bridges have been exposed to millions of load cycles from traffic. In addition, loads have become heavier due to the larger capacities of modern trucks. Not surprisingly, many vintage bridges are showing signs of cracking and need to be strengthened or replaced to maintain safe and efficient highway operations. Of particular concern is the capability of girders and cross-beams in bridges to withstand vertical shear forces caused by the weight of the bridge itself and by truck traffic.

ODOT has used three methods for increasing the shear capacity of girders and cross-beams: carbon fiber reinforced polymer composites (CFRP) applied to the surface, steel bars fitted to the surface, and steel bars installed internally. However, there was no comparison of these techniques that could help engineers decide which method was most appropriate for a particular situation. Consequently, ODOT contracted with Oregon State University to compare the various repair methods, analyze the expected life, and make recommendations for repair approaches.



Photo courtesy of Terra Magazine

Cross-beam undergoing testing

Thirteen large-scale girders and two cross-beams that replicated as closely as possible bridge components from the 1950s were fabricated and then loaded to cause cracking. After pre-cracking, the specimens were strengthened with epoxy crack injection, internal steel bars, external steel bars, surface-bonded CFRP, and near-surface mount CFRP. The girders and cross-beams were loaded to failure while sensors recorded how the specimens deformed. In addition, two bridges, one with surface-bonded CFRP and one with added internal steel, were instrumented before and after strengthening to determine the change in behavior. The test results were used in conjunction with previous research to compare the repair methods based on 10 attributes such as shear capacity improvement, aesthetics, durability, and installation requirements.

Surface-bonded CFRP, external bars, and internal bars were all effective in increasing shear capacity in girders. Epoxy injection had minimal impact on capacity, and there were not enough data to make a conclusion for near-surface mounted CFRP. A matrix generated as part of the research provided a comparison of advantages and disadvantages among repair techniques. Considering surface-bonded CFRP, external bars, and internal bars, no method was clearly superior, but internal stirrups did offer many advantages across the attributes considered.

The research verified the efficacy of past repairs, and it provided guidance to engineers for calculating design capacity for future repairs. The comparison among repair methods will aid designers when they consider issues that can affect performance of a bridge repair.



Girder after failure

Greenroads

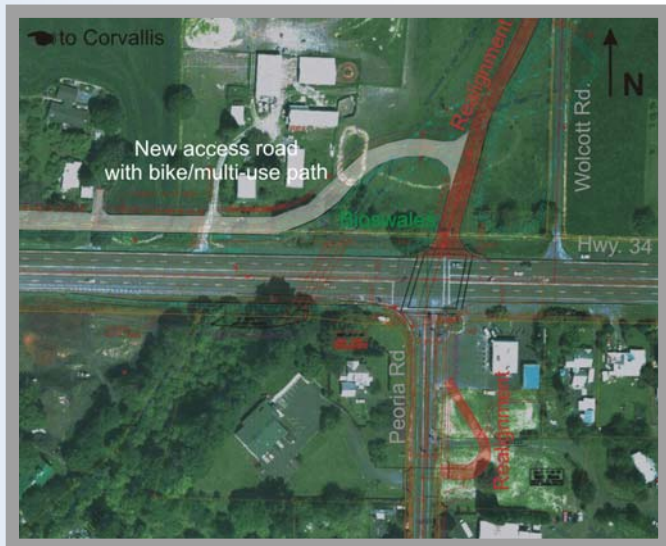
Greenroads (www.greenroads.us/) is a sustainability performance measure under development by the University of Washington (UW) and CH2M Hill. Sustainability is assessed on new and reconstructed or rehabilitated roadways through a credit-based system. Credits are awarded for select design/construction best practices. The point value varies according to the impact on roadway sustainability. There are 11 requirements for certification and a number of “voluntary credits.” Examples of practices qualifying for credit include: use of recycled materials, use of local materials, provision of bike/pedestrian access, use of environmental management systems, and longevity.

ODOT Research is working with Professor Steve Muench at UW to evaluate the potential use of the Greenroads metric in Oregon. Between four and seven projects will be assessed for sustainability using Greenroads. These case studies will help ODOT determine if the current credits are suitable for Oregon projects and if additional criteria should be considered.

One of the test projects is US 97, Lava Butte So Century Drive, south of Bend. The project is currently under construction and contains several unique features, including two wildlife undercrossings, one of which includes a bike/multi-use path. This project has the potential to become the first Greenroads certified project in Oregon.

Another test project is OR 34, Roche Wolcott Modernization Project, near Corvallis. The project is in the design stages and includes a separated access road, bike path, and unique wetland treatment. This project addresses the high accident rate of cross traffic on Highway 34 coming into Corvallis.

The research is expected to complete sometime in 2012 or 2013.



OR 34 Roche RD to Wolcott Rd, near Corvallis, Oregon. Aerial photo showing realignment at Peoria Road and Hwy 34

Green Freight

New Project Forges Relationships with Carriers, and Seeks Cost Effective Emissions Reductions

The movement of freight by truck contributes significantly to regional air pollution, and greenhouse gas emissions. According to the U.S. Department of Energy, light trucks contribute 27% of the national transportation greenhouse gas emissions and heavy trucks contribute 19% (2003). In addition, these activities have a notable impact on energy consumption and transportation network congestion. While policies and programs have focused on reducing the environmental footprint of passenger transportation for some time, little has been done to reduce the emissions from freight activity.

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Green Freight *continued from pg. 3*

Professor Anne Goodchild and her graduate students at The University of Washington (UW) in Seattle, together with ODOT and several industrial partners, have begun a research project investigating the possibilities for emissions reductions in pick-up and delivery systems. They are particularly interested in exploring the cost of emissions reductions to fleet operators, and the impact these changes will have on their ability to serve customers.

Cascade Express from Albany, Oregon has been chosen as one of the case study partners. With a fleet of 80 trucks, 298 53' vans, and 11 flatbeds, Cascade Express is a full service trucking company offering truckload, less than truckload, and specialized services to their customers on the west coast. The company has been proactive in their efforts to reduce their environmental footprint, and has agreed to share operational and financial data for the purposes of the research.



The research team has developed a fleet-based optimization model that can evaluate the impact of possible ODOT policies on the emissions, service quality, and financial cost of a fleet's operations. This model uses fleet, and customer data from industrial partners, emissions factors from the Environmental Protection Agency, and transportation network data from ODOT as inputs. The model then produces the least-cost and least-emissions truck routes and schedules to serve customer demands. In using this model, the team will be able to evaluate the cost and service trade-offs that are inherent in fleet operations, thereby identifying the most cost effective ways to reduce emissions. The model will be used both to evaluate internally driven changes (for example the carrier may decide to use larger trucks), or externally driven changes (for example, the impacts of roadway time of day use restrictions). This project will help to inform both our industry partners, and ODOT regarding the most cost effective ways to reduce freight emissions.

The model can capture emissions changes from a variety of sources including changes in:

- speed
- ambient temperature
- engine temperature
- vehicle capacity
- delivery time windows
- routes
- schedules
- expected congestion

This project is unique in that strong partnerships have been formed between industrial, research, and agency partners. This is necessary for the research, in order to provide results that genuinely capture transportation operations, and to inform ODOT regarding the potential impact of policy changes. In exchange for their cooperation, industry partners will help guide the research, resulting in more relevant analysis, and results that can help industry partners become more sustainable carriers by potentially reducing cost, and emissions.

Research Reports

Recently Published Research Reports

FY 2009 Oregon Transportation Needs and Issues Survey

The Oregon Transportation Needs and Issues Survey was first conducted in 1993 and has been done roughly every two years. The latest survey was completed in the fall of 2008 (State fiscal year (FY) 2009). The FY 2009 results showed a mixture of opinions. Most residents reported that they were satisfied with ODOT's maintenance of roadside rest areas, as well as other services such as the condition of bridges, safety features on highways, and the maintenance of Oregon's roads, highways and bridges. Oregonians were much less satisfied with ODOT's efforts to expand and improve roads to meet residents' needs, as well as other services such as efforts to improve the entire transportation system, the condition of pavements, and efforts to make transportation options available to all. In rating overall agency performance, the majority of Oregonians thought that ODOT was doing a good job.

Fleet Replacement Modeling

This project focused on two interrelated areas in equipment replacement modeling for fleets. The first area was research-oriented and addressed a fundamental assumption in engineering economic replacement modeling that all assets providing a similar service are equally utilized. It is shown that if assets providing a similar service are not equally utilized, than overall operational costs of a fleet increases. The second area addressed the need of the Oregon Department of Transportation (ODOT) Fleet Services Section for a modern, user-friendly, well constructed and documented fleet condition model. The state-of-the-art in equipment replacement modeling and the research on effective prioritization measures computable from existing data is discussed. A new model is developed utilizing the highest value of (Age/Age standard)+(Usage/Use standard) as a measure to prioritize equipment. The model is described and it is shown through simulation that the prioritization measure utilized performs better than several other suggested measures. This project was conducted jointly with the ODOT Fleet Services Section and the ODOT Research Section.

Historic Columbia River Highway Oral History

The Historic Columbia River Highway: Oral History Project compliments a larger effort in Oregon to reconnect abandoned sections of the Historic Columbia River Highway. The goals of the larger reconnection project, "Milepost 2016 Reconnection Project" (<http://www.oregon.gov/ODOT/HWY/HCRH/>), are to 'remember,' 'restore,' and 'reconnect' sections of the old historic highway. One of these sections includes the area between Cascade Locks and Hood River, which was abandoned or destroyed as part of construction of Interstate 84 (I-84).

The objective of the Oral History Project was to capture oral histories surrounding the areas of Cascade Locks to Hood River. As part of the project, 19 people were interviewed who had either lived in the area, helped to build sections of highway or interstate, or who have helped to preserve the historic area. Much of the cultural history of this section of highway has been lost since its abandonment over 50 years ago. This research project was aimed at culturally reconnecting the highway and providing information useful to the overall restoration of the highway as a trail.

Included in the report are recollections of the towns of Dodson, Bonneville, Cascade Locks, Viento, Sonny and Hood River, as well as memories of destinations along the Historic Columbia River Highway such as Crown Point, Multnomah Falls Lodge, Mitchell Point Tunnel, and others. Experiences from the highway builders and preservationists are also shared.

Research Notes

Recently Published Research Notes

Investigating Moisture Damage to Pavement

In the last several years, pavements in areas recently rehabilitated have exhibited significant distress. Oregon State University completed a forensic investigation, which included field investigations, personnel interviews and records reviews, of five projects showing such distress. The findings showed that improper tack coat or failure, permeable dense-graded layers, stripping, inadequate drainage and possibly inadequate compaction of dense-graded material were factors that likely contributed to pavement distress and rutting. As a result of the project, a set of four guidelines have been established for use in pre-construction site investigations, pavement design, construction techniques and materials selection and testing.



Excavation of travel lane for moisture investigation

The ConnectOregon Program

The *ConnectOregon* program provides grants and loans to support air, marine, rail and transit improvements on projects that are not eligible for highway gas tax funding. The Oregon Department of Transportation recently funded a study which examined the *ConnectOregon* I and II project selection processes, public outreach, the review and approval processes, and program participant feedback. One of the findings from this report was that within the transportation modes, Marine (47%) had the highest success rate (applications approved/applications submitted) followed by Rail (43%), then Transit (41%), and Aviation (38%).

Naturally Occurring Hazardous Materials

Earlier this year, ODOT Research Section began a project to identify the types and locations of hazardous materials that occur naturally throughout the state. The Oregon Department of Geology and Mineral Industries have compiled a preliminary list of 42 materials to be considered. Once the list is finalized, Geographic Information System (GIS) technology will be used to map where these materials are likely to be encountered. The ultimate objective of this work is to assure that ODOT maintenance and construction activities take the presence of these hazardous materials into account. In this way, ODOT can protect the health of those who work on ODOT projects and the general public from the disturbance of these materials

Evaluation of the Oregon Medically At-Risk Driver Program

Dr. James Strathman, a Portland State University researcher, recently completed an assessment of the safety risk of persons whose licenses were suspended under the Oregon Medically At-Risk Driver program. One of the primary findings of the study showed that the occurrence of a crash during the 18-month period prior to suspension was a significant predictor of the likelihood that a crash will occur after suspension. The results of the study could be used in several ways. For example, crash history information could be used in evaluating a person's application for reinstating driving privileges. In addition, for persons whose driving privileges have been reinstated, subsequent crash occurrence could be treated as a signal that re-certification is needed and/or that the person should again be required to successfully complete DMV testing.

T2 Center

Oregon Technology Transfer Center



The Research Section also manages the Technology Transfer (T2) Center. The T2 Center was officially established September 1, 1984 with little fanfare, but with a great deal of enthusiasm and high hopes for accomplishing its purpose. That purpose was to assist local agencies in obtaining the latest and best available information and training on transportation technology. The co-directors were Gordon Beecroft, ODOT Research Engineer, and Dr. Robert Layton, an associate engineering professor at Oregon State University. Dick Rumbolz, who some of you may remember, was the first T2 Center Coordinator.

The Oregon T2 Center was one of 20 Technology Transfer Centers established by the Federal Highway Administration (FHWA) in 1984 under the Rural Technical Assistance Program (RTAP) with the express purpose to furnish transportation information and training to local jurisdictions. Clients of the Oregon program were counties, cities, tribal governments, federal agencies, road districts and transit districts.

When the T2 Center was established, four tasks were identified that would help the Center achieve its purpose, even on a limited budget. Those tasks were: (1) publish a quarterly newsletter that will present transportation ideas, tips and a variety of information, including summaries of technical reports, and announcements of training courses and other special events; (2) provide low cost seminars and workshops on a variety of transportation topics; (3) provide, upon request, copies of technical reports on transportation research, experiments, or implementation projects of various kinds; and (4) to answer questions and respond to requests for technical information on transportation matters of all kinds.

A steering committee of local government representatives was appointed to help guide the program and direct activities of the T2 Center. Their points of view were used to assure that the Center's services were geared toward the needs of the clients.

Twenty-five years later the T2 Center continues to produce significant results on a limited budget with a staff of five that includes a director, T2 assistant and three part time trainers. The program is still partially funded by the FHWA under a program more appropriately named the Local Technical Assistance Program (LTAP) with matching funds coming from the Association of Oregon Counties (AOC), the League of Oregon Cities (LOC) and the Oregon Department of Transportation. A steering committee is still in place and the tasks remain virtually the same as they were 25 years ago but the level of emphasis has changed. The Center's role in providing technical assistance and technical publications to our customers has been reduced by technology and the availability of information via the internet. At the same time, the T2 video lending library is well used and continues to grow.

Training remains the mainstay of the T2 Center's program with new classes being added on a regular basis. In 2001 the Center added the *Roads Scholar* Level 1 training program, the popularity of which has exceeded expectations. As the T2 Center embarks on its next 25 years, it will rely on a strategic plan recently updated in September to guide the journey. For those who have expressed an interest in an advanced *Roads Scholar* program, you will be happy to know that the additional course offerings that the Center will pursue over the next couple of years includes the curriculum for a Level 2 *Roads Scholar* program.

http://www.oregon.gov/ODOT/TD/TP_T2/.