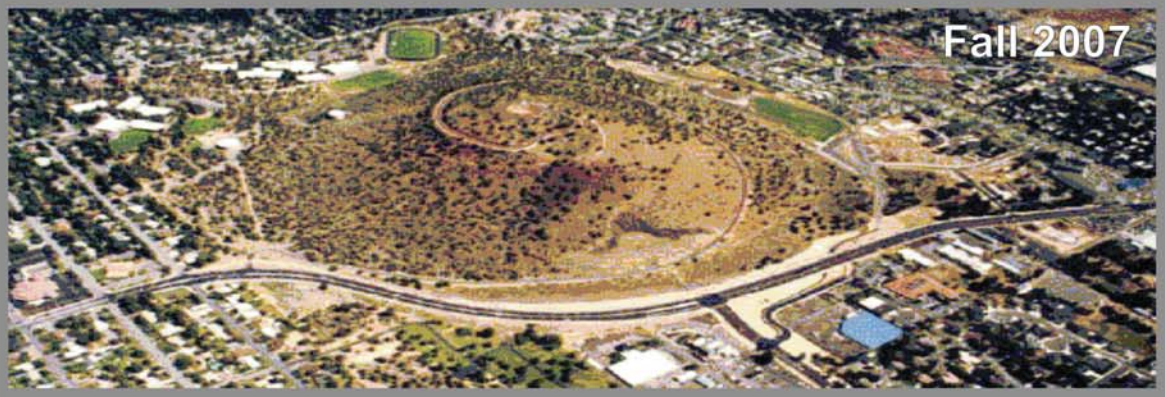
RESEARCH

Oregon Department of Transportation

Research Newsletter Fall 2007



In This Issue:

Do You Have a Research Idea?

The ODOT Research Unit is looking for ideas on transportation related research that would benefit Oregon's needs and interests.

Each year, the ODOT Research Advisory Committee (RAC) considers potential research projects submitted to the ODOT Research Unit. Funds and other resources are available for the following areas: research (study of a transportation problem), development (design and/or testing of a transportation tool or procedure), and technology transfer (demonstration of, or education about new transportation technologies).

Research ideas are proposed by submitting a "problem statement," which describes, in detail, the background and significance of the topic; potential benefits of the study; how the results would be used; and a projected time schedule and budget. These proposals may be submitted by anyone and are due by December 14, 2007.

All problem statements are reviewed by one of eight Expert Task Groups (ETG) listed to below:

- Construction and Maintenance
- Roadway Design and Human Factors
- Pavements and Materials
- Traffic, Safety, and ITS
- Structures
- Integrated Multimodal
- Planning and Economic Analysis
- Hydraulics, Geotechnical, & Environmental

The ETGs select proposals based on each group's research priorities for the coming year. Problem statements that pass this first stage of review will then be further developed to the second stage level and evaluated by the RAC next spring. Based on the ranking they receive, the FY 2008/2009 projects will be chosen.

All of the information and materials you need to submit a problem statement are on the ODOT Research Unit web page: http://egov.oregon.gov/ODOT/TD/TP_RES/ResearchProgram.shtml

If you have additional questions not answered on the web page, please feel free to contact Barnie Jones by phone: 503-986-2845 or by e-mail: Barnie.P.JONES@odot.state.or.us.

ODOT Research News

Reflective Cracks

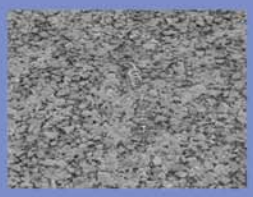
Geosynthetic Materials in Reflective Crack Prevention

Cracks in the roadway, which extend across both travel lanes, are a common occurrence in Oregon. The cracks typically become worse over time; they often spall and create bumpy riding surfaces. Deterioration to highways, such as transverse cracking, often results in the need for roads to be resurfaced. Even after an area has been repaved, cracks frequently appear or "reflect" at the same location on the new pavement overlay. This is referred to as reflective cracking.

Several manufacturers have designed geosynthetic products to prevent or lessen reflective cracking. The materials are supposed to minimize tension transferred to the overlay from the existing pavement. From 1998 to 2007, ODOT conducted an evaluative study of five geosynthetic materials in their effectiveness at preventing cracks from reflecting or worsening. The products were installed at a test site in Oregon and were revisited once each year to determine if the cracks had reflected, and if they had, measure their length and width. The width of the crack determined its severity, so that a narrow crack was low severity and a wide crack was high severity. Each of the sections was compared to its original condition, and it was also compared against the performance of similar products as well as a control.

At the end of the study, comparisons were made to determine how effective the geosynthetic materials were at controlling reflective cracking (by preventing or lessening their return). Of the materials tested, some geosynthetics appeared to have delayed cracks from worsening and becoming more severe, though no product proved effective at preventing cracks from reflecting.

A full report is available at: http://www.oregon.gov/ODOT/TD/TP_RES/ResearchReports.shtml. For any additional information please contact Amanda Bush at 503-986-2848 or by email at: amanda.bush@odot.state.or.us




Older Oregon Drivers

A Survey of Older Driver's Behavior and Driver Cessation

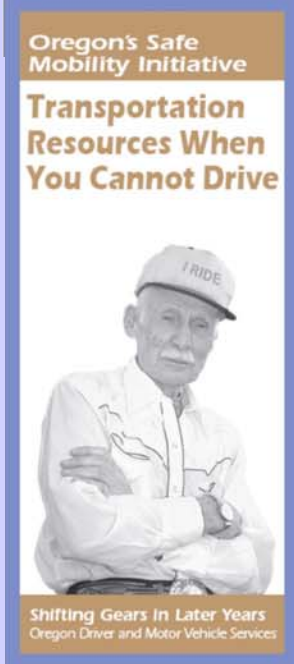
As part of a study of older Oregonian adults and their travel patterns, the Institute on Aging at Portland State University, with support from ODOT, undertook a statewide mail and telephone survey of both older drivers and former drivers. The former drivers were individuals who had voluntarily chosen to stop driving. The survey was designed to asses the transportation needs of older drivers and former drivers and to assist ODOT in planning for the future.

Former drivers were asked their reasons for ceasing to drive, and those who were currently driving were asked what forces or factors would cause them to give it up. Drivers were also asked if and how their driving behavior has changed as they have gotten older. Existing literature reveals that with age, older adults may experience loss of vision, changes in reaction and execution time, and loss of general cognitive abilities to the point that driving becomes hazardous. Proportionally more seniors die as a result of traffic fatalities than any other age group; and when vehicle miles traveled are considered, seniors are the second most likely age group to be in an accident. Some, but not all, older adults who experience physical or cognitive difficulties choose voluntarily to restrict or cease driving. Although the majority of older drivers do not pose a safety threat, previous research has found that some older drivers continue to drive even when they are not able to do so safely, while many choose to stop driving as a result of physical or other issues.

Results of this survey were analyzed to assess similarities and differences among rural and urban respondents, as well as among current and former drivers. The results of this study reflect those found in previous research, but elaborate on the factors contributing to older Oregonians' decisions to continue or to cease driving, the impacts of ceasing to drive, and the transportation needs of older Oregonians across geographic (e.g. urban versus rural) areas.

Key findings include:

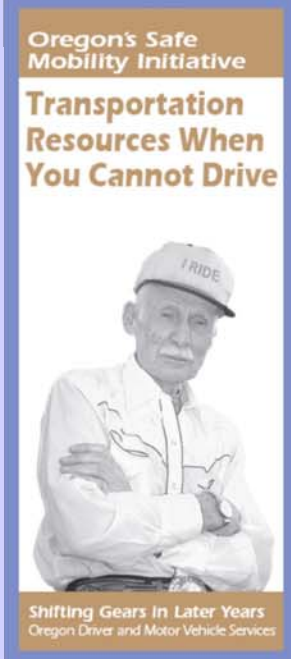
- The most common changes in driving made by older adult drivers in urban and rural areas alike were avoiding traffic congestion and avoiding rush hour. Common changes also included reduced night driving and avoiding bad weather.
- The health/physical and personal changes leading to changes in driving patterns occurred gradually over a period of time.



- When rating reasons for driver cessation, such as heath and personal factors, the perceived importance of those factors given by current drivers was higher than the actual importance assigned by former drivers.
- Those people most likely to have chosen to stop driving, had the following characteristics: female, older, in poor health, suffering from depression, living in senior housing, using alternative transportation when available, making fewer trips, and seeing fewer limitations associated with using alternative transportation.
- Among those who had actually stopped driving, the most commonly reported reasons were poor vision, loss of confidence in driving ability, perception they were an unsafe driver, and the availability of someone else to drive them.
- The biggest impacts of no longer driving were social isolation (reduced social activities, seeing friends less, reduction of work and volunteer activities) and decreased ability to visit places less.
- Key reasons for continuing to drive beyond the point when one should do so were emergencies, getting to medical appointments, and a lack of alternate transportation options.
- Over a third of both current drivers and former drivers were not aware of the transportation options available other than driving or relying on friends and family.
- Few drivers viewed the transit options available as viable alternatives to driving, and few of the urban drivers and former drivers alike *used* the transit options available for regular daily travel.
- Key limitations seen in the transportation alternatives available included a lack of service or limited service, and scheduling and reliability issues with dial-a-ride, appointment-based programs.
- In rural areas, especially, there was a lack of transportation options other than driving or relying on family and friends.
- Rural, as opposed to urban residents proved to be more keenly aware of the barriers to providing transportation alternatives in sparsely populated areas of the state.
- Among both current drivers and former drivers, the vast majority had not and would not consider relocating to have better access to transportation services.

If relocation were to be considered, factors seen as key in the decision-making process included access to public transportation and a setting where one could meet all of one's daily needs (e.g., shopping, medical care).

A full report is available at: http://www.oregon.gov/ODOT/TD/TP_RES/ResearchReports.shtml. For any additional information please contact Vince Vanderhyde at 503-986-3419 or by email at: Vincent.A.Vanderhyde@odot.state.or.us.



Polymer Overlays

Evaluation of Thin Polymer Concrete Overlays of Bridge Decks

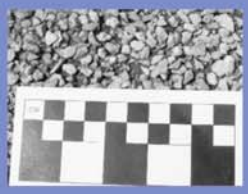
Concrete bridge decks deteriorate over time due to environmental and traffic exposure. Skid resistance often decreases, especially when studded tires are allowed. The concrete may crack, which can lead to deicing chemicals penetrating to the steel reinforcement and accelerating corrosion of the steel. Eventually, the bridge wearing surface will need to be replaced or, if the deck structure is compromised, the entire deck will need replacement.

Thin polymer overlays can prolong the life of bridge decks if the overlays maintain their integrity. Thin polymer overlays consist of a plastic resin applied to the deck surface with an aggregate covering. The resin helps hold the aggregate in place while also forming a seal on the deck surface. The aggregate provides skid resistance and acts as a wearing surface.

In the past, Oregon has had inconsistent results with this type of overlays. Some of the problems have included rapid loss of skid resistance, cracking and delamination.

ODOT is currently conducting a comparative study of thin overlay products to see which are effective at extending the service lives of bridge decks. There are eight unique products, each by a different manufacturer, that are being evaluated under service conditions and with laboratory tests. Field studies are being conducted at two separate bridges in Oregon that have average daily traffic of up to 15,000 vehicles. Each product was installed in 120-foot sections on the Willamette River Bridge at Newberg and on the South Yamhill River Highway 39, McMinnville Spur Bridge in July and August of 2007. The products were installed by or with the supervision of the manufacturers.

Follow-up evaluations of the test sections will take place roughly every six months for three years. Research will mainly be focused on general surface wear, cracking or inconsistencies in the surface, delamination, and skid resistance. Sections showing signs of distress will be monitored closely, and if conditions worsen the product will be removed. Field performance will be




compared to the results of the laboratory testing with the intent of developing a laboratory approach to predicting performance.

This study will help maintenance personnel select effective thin polymer overlay systems for prolonging the safety and life of bridge decks. For more information, contact Steve Soltesz at 503-986-2851 or by email at: steven.m.soltesz@odot.state.or.us.

Moisture Damage

Investigating Premature Pavement Failure Due to Moisture

Shortly after road surfaces are repaired or rehabilitated they sometimes show signs of distress, often leading to additional maintenance and costs. It has been suggested that these premature pavement failures may be due to moisture damage. ODOT Research has begun a project to investigate this theory.

ODOT Research has selected five representative project areas located throughout the state to study the effects of moisture on pavement. Pavement designs as well as construction plans and procedures have been reviewed. Preliminary studies have included pavement core samples, Ground Penetrating Radar investigations and examination of road stratigraphy (composition of layers) to determine underlying conditions. Lab tests will be preformed to determine pavement volumes and the amount of moisture penetration or permeability of the pavement layers.

The research is focused on identifying potential cause(s) of premature pavement failure. It is hoped that the research will lead to the development of methods for the identification of potential moisture related problems, and improved guidelines for initial pavement design, materials selection and better construction techniques.

For more information please contact Norris Shippen at 503-986-3538 or by email at: Norris.SHIPPEN@odot.state.or.us.

Research Reports

Recently Published Research Reports

Evaluation of the Oregon DMV Driver Improvement Program

(FHWA-OR-RD-07-08)

This report provides an evaluation of the ODOT DMV Driver Improvement Program, which was substantially changed in 2002. Prior to 2002, the Driver Improvement Program was organized around four progressive steps involving advisory letters, warning letters, probation, and suspension. The current program is organized around two steps: restriction and suspension. After evaluation of the program, recommendations were made to re-institute warning letters, and to assign a greater weight to crashes in triggering license actions.

Adjustment of Driver Behavior to an Urban Multi-Lane Roundabout

(FHWA-OR-RD-07-09)

In the summer of 2006, the city of Springfield, Oregon installed the first urban multi-lane roundabout in the state. It was hypothesized that after installation, speed variability on approaches to the intersection would decrease from the values with the previous signalized intersection. It was also hypothesized that the initially observed high incidence of driving errors associated with specific areas of the roundabout would decrease over time. Before and after speed recordings of approach roads to the intersection revealed a significant increase in mean speed, but no consistent change in speed variability. Some design features caused initial confusion amongst drivers negotiating the roundabout, but the number of observed incidences of confused behavior declined over the first six months of operation at a rate that fit a classic logarithmic learning curve.

Geosynthetic Materials in Reflective Crack Prevention

(OR-RD-08-01)

Reflective cracking due to shrinkage and brittleness in asphalt pavements can seriously degrade an asphalt overlay before it is near the end of its design life. Geosynthetics have been used to impede the reflection of existing transverse cracking to the new overlay. ODOT installed a test section consisting of 98 transverse cracks treated with five different geosynthetic types, 22 transverse cracks treated with crack filling only, and a control section of 20 untreated transverse cracks. The test and control sections were monitored from 1999 to 2007. Each of the 140 test sites were revisited once each year to determine if the cracks had reflected. At the end of the study comparisons were made to determine if the geosynthetic materials were effective at controlling (by preventing or lessening the return of) reflective cracking.

2007 Transportation Needs and Issues Survey – Summary Report
(FHWA-OR-RD-08-02)

The Transportation Needs and Issues Survey, conducted in 2006 by the Survey Research Center at Oregon State University, assessed public opinion in Oregon on a variety of transportation issues. The survey used a random digit dialing telephone survey method and completed a total of 1,013 interviews. The random sample was stratified by ODOT Region and contained at least 200 completed interviews per region. Findings from the survey are discussed in the report.

Evaluation of Oregon Department of Transportation Project Delivery
(FHWA-OR-RD-08-03)

This report summarizes an analysis of ODOT methods of insourced and outsourced project delivery using data obtained from ODOT reporting systems, ratings of project effectiveness by ODOT Area Managers and by construction contractors, and interviews with ODOT Area Managers and managers from engineering consulting firms that ODOT uses for outsourced design-bid-build projects. Guidelines, including a decision tree, are provided for assignment of projects for insourced design-bid-build, outsourced design-bid-build, or design-build delivery.

Research Notes

Recently Published Research Notes

Customized Live-Load Factors for Bridge Load Rating

Researchers examined ODOT's weigh-in-motion (WIM) data to re-evaluate bridge restrictions and update customized live load factors for Oregon specific Load and Resistance Factor Ratings (LRFR). Results of the research not only provided updated specific load ratings for ODOT bridges but were also used to provide input for the ODOT Mechanistic Empirical Pavement Design Guide.

Drainage Facility Asset Management: More Than an Inventory of Pipes

The goal of this project was to develop and implement an Oregon-specific system for inventorying and evaluating the condition of pipes, culverts, and stormwater facilities based on the FHWA Culvert Management System (CMS); and to determine the time and effort required to collect and input data on all culverts, pipes, and stormwater facilities within the entire ODOT transportation system, based on data collected during a small pilot project.

T2 Center

Oregon Technology Transfer Center

ODOT Research also manages the Technology Transfer (T2) Center. The T2 Center is jointly funded by ODOT, the cities and counties of Oregon, and the Federal Highway Administration under the Local Technical Assistance Program (LTAP).

The Center publishes information on transportation technology in their quarterly newsletter, *Oregon Roads*. They also distribute informational materials to local agencies through a "Circuit Rider" service, provide technical resources on request, and have a large lending library of available audio/visual programs on a variety of transportation topics.

The T2 center is the facilitator of the popular *Roads Scholar* program. The *Roads Scholar* program provides free up-to-date road maintenance and safety related training for local government personnel. The program consists of several training sessions on current procedures and the latest technologies that count for credit hours. Those completing a set number of credit hours will receive a certificate acknowledging their graduation from the program. For more information on the Roads Scholar program please visit http://egov.oregon.gov/ODOT/TD/TP_T2/RoadsScholarProgram.shtml

Additional information regarding the T2 Center is available at: http://www.oregon.gov/ODOT/TD/TP_T2/index.shtml. The current issue of the *Oregon Roads* newsletter providing the latest in T2 news, as well as past issues, is also available on the web site. For more information, contact T2 Center Director Bob Raths at 503-986-2854 or by email 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.

Update

Research Personnel Changes

After serving nearly 60 years in a variety of positions with ODOT, Dick Young, who was most recently a Circuit Rider and trainer for the T2 center, retired this past July. Dick had worked with the T2 center for over 20 years. In early August, Dick's position was filled by Dave White. Dave, who retired from the

agency after 34 years as the Safety and Risk Manager in 1994, has continued to serve as a contract trainer for both the ODOT Office of Maintenance and the T2 Center. Dave's background in work zone safety and his knowledge and expertise will serve the T2 customers well.

There were two other personnel changes in the Research Unit. With the departure of ODOT Executive Support Specialist, Deborah Martinez, the Research Unit welcomes Linda Perkins. Linda worked with the ODOT Research Unit in August as a temporary employee and was hired as a permanent employee in September. Linda's past experience includes working for the State of Oregon on budgets. She has also worked with both the Department of Administrative Services and ODOT. She is a welcome addition to the Research staff.

Brand new to ODOT and State employment is Research Analyst Amanda Bush, who was hired in June of 2007. Amanda brings with her a background in research and report writing. At her new job she will work with editing and formatting publications, conduct field data collection, and conduct and assist in research projects. When asked about her appointment with the Research Unit, Amanda commented, "I am excited to have the opportunity to work for the State and be a part of a research team seeking to improve the transportation system through research."

These new staff members join a team of experienced researchers and support personnel at the ODOT Research Unit.