RESEARCH

Oregon Department of Transportation

SPRING 2010

ODOT Research News

In This Issue:

New Research Projects Announced

Early this year, the ODOT Research Advisory Committee met to review, discuss, and vote on which proposed research projects would move forward as part of the next fiscal year's research program. The top eight selected were:

- Shrinkage Limits and Testing Protocols for ODOT High Performance Concrete
- Criteria for the Selection and Application of Advanced Traffic Signal Systems
- Assessment of Copper Removal from Highway Stormwater Runoff Using Fish Bone Meal
- Underwater Noise Generation and Propagation Resulting from Pile Driving
- Comparison of Pelletized Lime with other Anti-stripping Additives
- Developing Safety Performance Measures for Roundabout Applications in Oregon
- Premature Asphalt Concrete Pavement Cracking
- Measuring the Performance of Transit Relative to Livability

The following additional four were conditionally approved, contingent on funding:

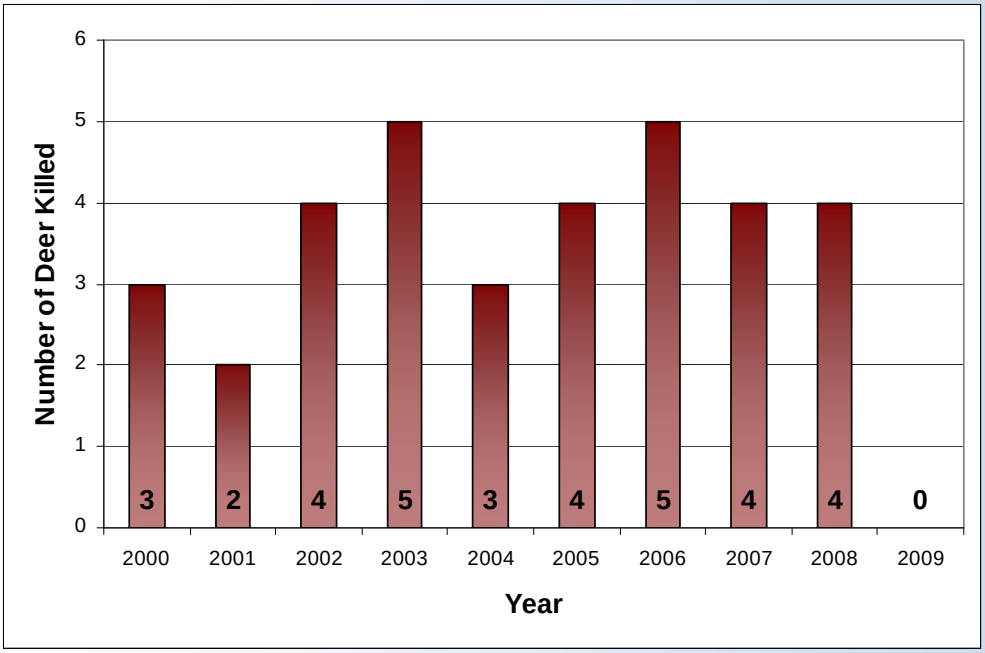
- A Corrosion Monitoring System for Existing Reinforced Concrete Structures
- Wireless Data Collection System for Travel Time Estimation and Traffic Performance Evaluation
- Determining Outsourcing Feasibility and Standard Pricing Methodologies
- Characterizing Oregon's Supply Chains

For ongoing status updates on these projects and more, visit the Research website at: **www.oregon.gov/ODOT/TD/TP_RES/**.

Local Action for Wildlife Crossing

Since the year 2000, residents of Sisters Loop, a private road in rural Lane County, have been concerned by the large number of auto/deer collisions occurring on the section of Dillard Road adjacent to their homes.

This approximately 0.5 mile long section is bordered by brush and trees and contains two small springs, features which are attractive to deer. An average of 3.7 doe/fawn fatalities per year (with a standard deviation of .97) were observed during the period 2000-2008 by Dr. Robert Olsen, one of the local residents. All of the deer were killed from September through December of each of the years. The lowest number of deer killed was two in 2001, and the highest was five in both 2003 and 2006. Only two bucks have been killed in the last nine years. Comparing collisions to a nearby, much longer, section of Dillard road, the average annual deer kill is 1.6 animals. The speed limits of the areas vary, from 45 MPH in the project area to 35 mph in the other section.



After studying deer collision research and conferring with ODOT staff, Dr. Olsen thought that flashing lights may provide a low cost, short term, solution. That is, research shows that drivers tend to be alerted by flashing lights when the lights are not permanent fixtures on a section of roadway. In this case, the lights were to be lit only at night from September 1st to December 1st for test purposes.

Dr. Olsen approached the Lane County Public Works Department in August of 2009 with a proposal to install two yellow flashing lights to the standard deer signs on the section of road. The flashers were standard construction strobe lights with an output of 4.8 candela. They were obtained for $120, and were paid for by Dr. Olsen. The lights were solar powered and only operated during nighttime hours. The lights were installed by Lane County personnel. There was a standard deer sign and strobe at each end of the half-mile test section.

During the test period no deer collisions were observed by, or reported to, Dr. Olsen in the project area. However two deer were killed on other sections of Dillard road within two miles of the test section. The kill rate was typical for the adjacent road sections. Residents observed a greater than usual number of does with fawns in the spring of 2009. There were many instances of does with twins. In addition, residents reported that the deer seemed to be browsing the road edges as usual. In general there were no significant changes near the road test section during the test period.

...Continued - see Wildlife Crossing, page 3

Wildlife Crossing continued...

Statistically, the result of zero deer killed is significant at the 1% level given the historical mean of 3.7 and a standard deviation of 0.97 with an N of 9. Thus it is very likely that the lower kill rate was associated with the addition of the strobe lights. From an economic point of view, the strobe lights seem to have been an efficient solution given that a single auto/deer collision can easily result in thousands of dollars in damage, which may be avoided by purchasing and installing a light ($120 for light, plus installation expenses). Admittedly the road jurisdictions themselves only experience the negative direct cost of the beacons. However, road operating authorities are responsible for road safety and accountable to road users that support building and maintenance.

One less than ideal aspect of the experiment was the lower than desired strength of the strobe lights (more powerful solar strobes were available, but at a higher cost). While the flash was visible at the top of the deer sign from 0.6 mile, a stronger flash might have better attracted driver's attention.

The residents of Dillard road acknowledge and thank Edward Chastain and Eric Wurster of Lane County Public Works for their advice, assistance and support of this safety oriented experiment.

A Look at Motorcycle Lane-Sharing

In the past decade, the United States has experienced a large increase in motorcycle endorsements and registrations. This influx, coupled with growing concerns over traffic congestion and limited resources, has created interest in the potential use of motorcycle lane-sharing. While mostly prohibited in the United States, with the exception of California, motorcycle lane-sharing, also known as lane-splitting or filtering, is a common practice in many countries around the world. Lane-sharing allows motorcycles to take advantage of parts of the road not being utilized by allowing them to pass between lanes of stopped or slower-moving vehicles.

Allowing motorcycles to move more freely through traffic could help reduce overall congestion, and potentially reduce some types of motorcycle crashes. There are, however, significant safety concerns regarding motorcycle lane-sharing. A motorcycle traveling between rows of moving vehicles in the same lane is vulnerable to different threats, such as vehicles suddenly changing lanes or opening doors. Vehicle passenger safety is also of concern as lane-sharing may reduce an operator's ability to predict, and therefore, react to traffic movement around them.

A review of literature relevant to lane-sharing revealed that research on the topic is limited. Relevant to the safety implications of lane-sharing, motorcycle crash causation studies provided the most direct information on lane-sharing. Studies, such as the 1981 Hurt report and the 2009 MAIDS report, considered lane-sharing as a causation factor. Statistics from these and other publications showed that lane-sharing was a factor in <1% to 5% of motorcycle accidents. Because studies incorporating lane-sharing as a potential causation factor are limited, the range presented above should be considered with caution.

From the review of literature it is clear that additional research on lane-sharing is needed. For locations newly allowing lane-sharing, methods for collecting benefit and safety data should be considered so that the understanding of the impacts of lane-sharing may be more fully considered in the future.

The final report was published in May 2010 and is available online at **http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2010/Motorcycle_Lane_Sharing.pdf**

Research Reports

Recently Published Research Reports

Photo Radar Speed Enforcement in a State Highway Work Zone: Demonstration Project Yeon Avenue

The 2007 Oregon legislative assembly passed House Bill 2466, allowing the Oregon Department of Transportation to use photo radar in ODOT work zones on non-interstate state highways and required ODOT to report back to them on the safety impacts of this enforcement action. This research project examined the impact of photo radar speed enforcement on traffic speed through an active highway work zone. The project also examined the speed data in an attempt to find speed impacts that persisted following the photo radar enforcement periods. During photo radar enforcement periods, speeding was reduced by an average 27.3% at the traffic sensor site within the work zone. The observed speeding reduction was temporary and did not persist beyond the departure of the photo radar enforcement van.

Evaluation of Fuel Usage Factors in Highway Construction in Oregon

Prices for different construction materials change frequently. In recent years, the price for these different materials has dramatically increased. This result leads contractors to inflate the bid price for a construction project in order to cover the potential increased cost. In an attempt to modify the inflation inserted into bid prices, the Oregon Department of Transportation allows for adjustments in the monthly payment to the contractor for various inputs. One major input that receives an adjustment is fuel. The contractor is eligible to receive adjustments in the monthly payments for fuel when the project is of a certain magnitude. After the project qualifies for the adjustment, when the price of fuel varies by more than 25% positive or negative from the previous month, ODOT will make a fuel price adjustment to the monthly payment. The fuel price adjustment is a function of a fuel usage factor. The value for the fuel usage factor for different bid items is based on an over 35 year old 1974 national survey titled, "Fuel Usage Factors for Highway Construction."

From that original survey the fuel usage factor for each bid item was recommended to be multiplied by the distance, weight, or volume built of the respective bid item, but not for structures. The fuel usage factor for structures was to be multiplied by the gallons of fuel used per $1,000 worth of work. The research presented in this report determines from a national survey whether other states, and their DOTs, use this same procedure to calculate a fuel price adjustment, and if so, whether the values for the fuel usage factors are the same. In addition, the report examines how the price of structural construction has changed over time to ascertain whether the current fuel usage factor for structures is still applicable. A new index is developed in a national model and one for the state of Oregon.

Financing Mechanisms for Capital Improvements: Interchanges

This report examines the use of alternative local financing mechanisms for interchange and interchange area infrastructure improvements. The financing mechanisms covered include transportation impact fees, tax increment financing, value capture financing, local improvement districts, transportation corporations, state infrastructure banks, local option transportation taxes, fair share mitigation, and transportation concurrency. The financing alternatives are assessed in the context of Interchange Area Management Plans, which are required by the Oregon Transportation Commission, as well as in the context of the Oregon Department of Transportation's responsibilities under the state's Transportation Planning Rule.

Research Notes

Recently Published Research Notes

Recycling Roads and Roofs

Oregon currently allows up to 30 percent recycled asphalt pavement (RAP) by weight to be used in hot mixed asphalt concrete (HMAC). In 2008, ODOT was asked to consider also allowing recycled asphalt shingles (RAS) in HMAC. While using recycled materials can create short-term benefits such as reduced cost and environmental impact, the performance of HMAC with RAS has been unclear. A preliminary study was developed to determine the effects of the addition of five percent RAS in blended asphalt binder. Evaluations showed that all RAP and RAS combinations had a significant impact on the performance grade of the blended binder. The preliminary study provided recommendations for changes to the mix design method as well as specifications for HMAC incorporating RAS and RAP for use in special provisions for a pilot study. The pilot study will take place in the summer of 2010 as part of secondary, more extensive examination of RAP and RAS use in HMAC.

Developing Corridor Level Truck Travel Time Estimates and Other Freight Performance Measures From Archived ITS Data.

Existing intelligent transportation systems (ITS) data from Oregon's weigh-in-motion (WIM) program for trucks, Green Light, was explored to determine if travel time estimates and other performance measures could be developed for freight. The WIM stations record the identifier (transponder) number for each truck, and weight, among other measures. The project demonstrated that it is feasible to use the WIM data to develop long-term corridor performance monitoring of truck travel (for example, corridor production and consumption). From the perspective of a real-time traveler information system, there were too many shortcomings – mainly the large spacing of the stations – in the data to implement without additional improvements.

Safety at High-Speed Intersections

Many rural intersections occur at locations with approach operating speeds of 45 mph or greater. These locations often occur on rural or urbanized two-lane or multi-lane highways. In the United States and Oregon, crashes at high-speed signalized intersections are a significant safety concern.

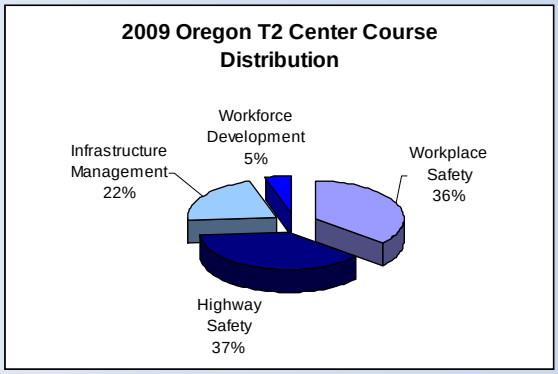
A 2010 study for ODOT by researchers at the Oregon State University School of Civil and Construction Engineering titled, *Evaluating Safety and Operations of High-Speed Signalized Intersections*, examined effective means for improving safety at isolated, high-speed, signalized intersections with posted speed limits of 45 mph or greater and at least one approach isolated by one mile or greater distance. The study report contains case studies with example applications of this procedure for eight sample intersections.

The research team recommended that ODOT use this general template as a tool for evaluating and improving the safety of Oregon's isolated high-speed signalized intersections by implementing a system requiring periodic analysis. This arrangement would ensure that irregular crash trends are quickly recognized and appropriately treated.

T2 Center

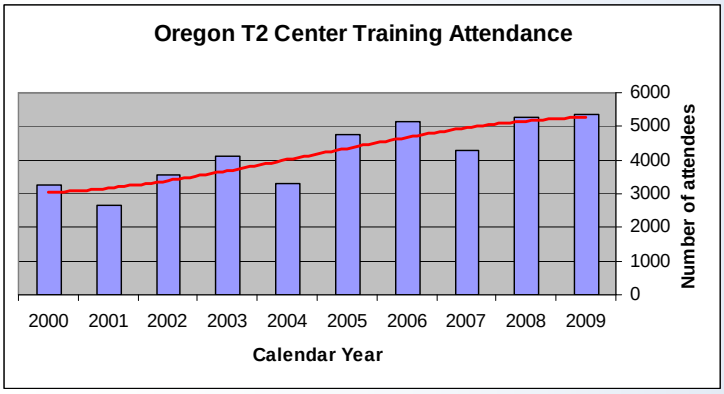
Oregon Technology Transportation (T2) Center

The primary focus of the T2 Center is to provide low-cost training to its customers. The training program is a blend of classes directly available from the Center. In 2009, the T2 Center sponsored and co-sponsored 195 training sessions, covering 58 topics. The classes were reported in four different categories and the chart to the right illustrates course distribution and focus areas.



There were 5,356 attendees at the 195 classes, for a total of 20,107 contact hours of training. As illustrated in the next chart, the steady increase in class attendance has been enjoyed for almost 10 years has leveled off. We plan to maintain that level of training by continuing to hold the line on expenses, pursue new partnering efforts and explore more expedient ways to deliver training. With additional funding granted, our goal is to reach even more students in the near future.

In addition to providing training classes, the Oregon T2 Center publishes a quarterly newsletter that is distributed electronically to over 1,300 recipients. The Center also distributes and/or loans publications and videos. In 2009, the Center shared almost 25,000 technical publications with our customers and loaned out 134 videos on the same four focus areas. Annual visits by T2 Training Specialists (Circuit Riders) are made to counties and cities throughout Oregon. A total of 223 county and city public works offices were visited by T2 Center representatives, who delivered and discussed packets with T2 Center training information and current technical publications and other material.



During the first half of 2010, the T2 Center has been quite busy. We partnered with the Oregon Chapter of the APWA in presenting a number of multi-day training events: the *Developing Leader*, *Street Maintenance and Collection Systems Spring School*, and *Preventive Maintenance for Roadway Surfaces* workshop.

During the same period, we offered 22 ***Roads Scholar*** classes. The *RS-5 Asphalt Pavement Maintenance 1* and *RS-6 Asphalt Pavement Maintenance 2* classes were each presented at 10 locations in western Oregon, and the *RS-9 Maintenance Math* and *RS-10 Introduction to Survey and Grade Checking classes* were offered at the *2010 APWA Street Maintenance and Collection Systems Spring School.*

In addition to our partnership training and our ***Roads Scholar*** program classes, the T2 Center also provides a number of no-cost training classes upon request through our three in-house Circuit Riders. These trainers have taught 69 classes to over 1,300 students through June.

A summary of the training classes sponsored and co-sponsored by the T2 Center can be viewed on our website at: **http://www.oregon.gov/ODOT/TD/TP_T2/**. For any questions about the T2 Center or services offered, please contact Rebekah Clack at the T2 Center by calling (503) 986-2855.