



# REVIEW

Published by the Nevada Department of Transportation, Research Division

## Research Bulletin

### NEW RESEARCH PROJECTS FOR FY 2006

#### *Evaluation of Animal Warning Systems in Reducing Animal-Vehicle Crashes*

Many studies have been conducted nationwide to evaluate the effectiveness of roadside reflectors in reducing animal-vehicle crashes. However, because of changing factors such as animal population densities, animal migration patterns, and traffic patterns, most of the studies are inconclusive or have mixed results. In Nevada, a three-mile installation of roadside reflectors on U.S. 50 near Dayton was evaluated for over two years. Unfortunately, the study was also inconclusive because of a very limited number of collisions recorded during the evaluation period. To continue the evaluation and search for an effective product in reducing animal-vehicle collisions, an in-house research project has been initiated. The research will examine several possible animal warning systems in two or more areas with historically high rates of animal-vehicle collisions. Mr. Jay Van Sickle, NDOT Traffic/Safety Division and Dr. Reed Gibby, NDOT Research Division will direct the research efforts with other members of the research panel from NDOT Environmental Division, NDOT Districts, Nevada Department of Wildlife and FHWA.

collisions. To increase the safety of pedestrians at some heavy traffic crosswalks, Mike Feuss, District II Urban Traffic Engineer, Mr. Tom Lightfoot, NDOT Traffic/Safety Division, and Dr. Reed Gibby, NDOT Research Division will conduct an in-house research project to evaluate in-pavement crosswalk flashers. Several products at various sites will be examined in the study. The evaluation criteria will include maintainability, durability, visibility, motorist conformance, safety experience, cost, and public reaction to the product.

#### *Evaluation of New Technologies for Improving Winter Vehicle Safety*

Reduced visibility is a major problem in snowplow operations. Safety and protection of the operator and road users is a challenging task. A research project was approved to evaluate new technologies to assist the snowplow operators with visibility problems, vehicle location problems, means of removing the falling snow and frost from windshields, and the visibility of snowplow trucks. The technologies selected from literature review will be evaluated and tested using criteria such as efficiency for the proposed task, cost, reliability, and maintainability. Dr. Cahit Evrensel, Dr. Kwang Kim and Dr. Yanyao Jiang in the Mechanical Engineering Department of the University of Nevada, Reno, will be the principal investigators for the project.

### In This Issue

Pg. 1 .. New Research Projects

Pg. 2 .....New Research Projects

Pg. 3 .. New Research Projects

Pg. 3 .. New Research Cycle

Pg. 4 .. PEC Meeting Recap

#### *Evaluation of In-Pavement Crosswalk Flashers*

Nevada 2002 crash data suggests that when a pedestrian is involved in a traffic collision, a fatality is 12.8 times more likely and an injury is 3.8 times more likely than for non-pedestrian

#### *Evaluation of the Effectiveness of Advanced Technologies for Work Zones*

To improve work zone safety and reduce motorists' anxiety while traveling through work zones, Dr. Hualiang Teng at the Transportation Research Center, University of Nevada, Las Vegas, will lead

New Research Continued on Next Page

a team of researchers in testing and evaluating the effectiveness of advanced technologies for work zones. The project will test two typical systems: 1) Speed monitoring displays, and 2) Automatic work zone information systems. The integration of these two systems as a single system will also be tested for applications in some work zones. The test will examine their effectiveness in improving safety and mobility. Based on the test results and a benefit/cost analysis, guidelines will be developed and provided to NDOT for future use in work zones.

### *Effects of De-Icing Salts on Roadside Vegetation in the Lake Tahoe Basin*

To help understand the impacts of de-icing salts on roadside vegetation in environmentally sensitive areas such as Lake Tahoe Basin, a research project has been initiated to address two fundamental questions:

1) What is the degree of salt injury to roadside vegetation? and (2) What are the long-term impacts of de-icing salts on roadside vegetation? Comparisons of the research findings with those obtained from a previous study conducted in 1989 will be made to quantify the potential short-term and long-term impacts of de-icing salts on roadside soil salinity, and the survival and health trends of vegetation along highways in the Lake Tahoe Basin. Multiple linear regression and multivariate analyses will be used to examine interrelationships among vegetation characteristics, soil and leaf chemistry. Dr. Robert Nowak at the Department of Natural Resources and Environmental Science, University of Nevada, Reno, will direct the research project.

### *Testing Queue Detection Systems for Preventing Accidents in Nevada*

It is very common in peak periods for queues to back up from some Nevada freeways to connected arterials or vice versa. These queues often interfere with through-lane traffic. Motorists are often not prepared for rapid reduction of speeds, resulting in an increased rate of crashes in these situations. To reduce such crashes caused by short-term surges in traffic and the resulting queues, Dr. Hualiang Teng and

Dr. Venkatesan Muthukumar from the University of Nevada, Las Vegas, will work with NDOT to evaluate the performance of some queue detection systems using such measures as spatial distribution of vehicle deceleration, lane changes and speed reductions. Based on the research findings, guidelines will be developed for future deployment of queue detection systems for major events, particularly in the Las Vegas area.

### *Guidelines and Field Implementation of Signal Left-Turn Controls*

Left-turn related vehicle crashes make up approximately ten percent of the total crashes on Nevada highways. To address this safety issue and develop guidelines for signal left-turn control, a research project has been initiated. The specific objectives of this project are: 1) Synthesize existing guidelines with state-of-the-art practices related to selection of left-turn control; 2) Identify and address the issues that are critical to Nevada's practices; 3) Implement and test the effectiveness of varied time-of-day, left-turn controls; and 4) Develop a comprehensive guideline on selecting left-turn control type based on Nevada's conditions. Dr. Zong Tian, at the University of Nevada, Reno has been chosen to conduct the research.

### *Evaluation of Signal Preemption for Emergency Vehicles*

Signal preemption is designed to interrupt pre-set signal times so that emergency vehicles can respond more quickly to incidents. A growing concern from the use of Emergency Vehicle Signal Preemptions (EVSP) is the disruption caused to the general traffic flow and the potential for crashes involving emergency vehicles. To improve safety and efficiency in the use of EVSP, NDOT approved a cooperative research project with the Regional Transportation Commission of Clark County. The objective of the study is to investigate, review, evaluate and recommend suitable operational strategies for EVSP at signalized intersections. Dr. Mohamed Kaseko at the University of Nevada, Las Vegas, will direct the study.

New Research Continued on Next Page



### *Prescriptive Mixture Design of Self-Consolidating Concrete*

Self-consolidating concrete is a concrete that can be placed and compacted under its own weight with little or no vibration effort, while remaining homogeneous and cohesive throughout the placement process without segregation or bleeding. NDOT has started using this technology to ensure proper filling and good structural performance of heavily reinforced structural members. However, to gain wider acceptance of self-consolidating concrete in Nevada, there is an immediate need for a comprehensive evaluation of the technology under Nevada conditions and development of construction specifications. Hence, Dr. Nader Ghafoori at the University of Nevada, Las Vegas, is conducting a one-year study to evaluate self-consolidating concrete and establish specifications and acceptance criteria for NDOT's use.

### *Techniques to Improve Safety and Operations at Signalized Diamond Interchanges*

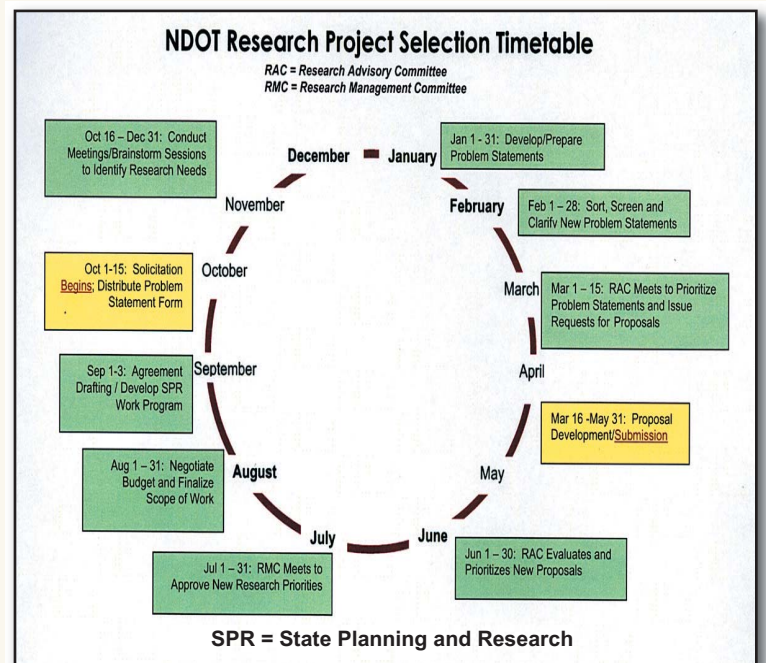
A diamond interchange serves as a major interface between a freeway and a surface street arterial. It has the characteristics of high traffic demands, high turning traffic volumes, high crash locations, and the creation of operational bottlenecks for urban roadway networks. A major safety concern is queuing between two signals where the spillback results in blockage of the interchange including traffic backups onto the freeway mainline. Over the next two years, Dr. Zong Tian, at the University of Nevada, Reno, will study techniques to improve safety and operations at signalized diamond interchanges. The major objectives of the research are: 1) Develop strategies/techniques for improving existing diamond interchange operations, and 2) Implement and test the selected techniques at some diamond interchange locations in Nevada. Based on the research findings, guidelines will be developed for implementing diamond control techniques during the stages of planning, design and operation.

## A New Cycle of Research Program Started

On October 1, 2005, a new cycle of the NDOT research program started. The Research Division is in the process of soliciting research ideas that would address NDOT problems and/or facilitate implementing new technologies and products for the improving of operations. We are working with NDOT Divisions and Districts, along with Nevada universities to identify the department needs for research, and develop research problem statements to address them.

A research problem statement form has been sent out to all the NDOT employees, Nevada universities and local transportation agencies. Problem statements may cover any facet of NDOT such as administration, policy, planning, safety, human resources, roadway design, construction, maintenance, pavements, structures, materials, etc. Anyone may submit a research problem statement before January 31, 2006, for consideration to be included in the fiscal year 2007 research program.

The research problem statements received will be evaluated and selected following the established process and timetable for research (see below). For more information or questions about the NDOT research program, you can contact Tie He at [the@dot.state.nv.us](mailto:the@dot.state.nv.us) or Reed Gibby at [agibby@dot.state.nv.us](mailto:agibby@dot.state.nv.us).



# — Product Evaluation Committee (PEC) Meeting Recap —

## PEC Approves New Acceptance Criteria and Establishment of Type I and Type II Tackifier Categories

Because of recent difficulties in evaluating mulch tackifiers proposed for addition to the Qualified Products List, Hydraulic Engineering conducted an evaluation of the current practices and development of new acceptance criteria for this product category. Based on research of methods and specifications employed by other state DOTs, two general categories of tackifiers have been identified: **organic** (dry powder tackifiers); and **chemical** (which are more like a glue, and are called liquid tackifier emulsions). Organic tackifiers include plantago and cornstarch based products; all of which have good performance characteristics. The results of work done by Hydraulic Engineering indicated that for the standard type of hydro-seeding, organics typically last about nine months, which is about the time needed before fall re-seeding so that plants can establish themselves for the next spring and summer. While organic tackifiers are generally preferred over the chemical tackifier, chemical tackifiers last longer and are better when used in places where long-term (more than a year) mitigation is needed.

To ensure that a contractor uses a tackifier specified for a particular project, the committee approved a motion to implement the new acceptance criteria and designate tackifiers as either Type I (organic) or Type II (chemical) products.

## PEC Terminates Dri-Water Product Testing

In September 2002, a field test of the Dri-Water time-release product was approved for field testing by the PEC. There were 252 plants composed of Jeffery Pine, Rabbitbrush and Sagebrush. They were planted in late April on plots within right of way of I-580 near Washoe City. The primary concern derived from analysis of the field reports was the high rates of plant fatalities. Several factors could have caused the problem: poor soil drainage, poor aeration, and poor drying of the weed mat, lack of minerals in the soil attributed to soil amendments, possible formation of a salty layer within the root zone, high springtime precipitation and deer/rabbit repellent. A memo from the Landscape Architect Office recommended some type of testing be continued. After a brief discussion, the committee came to a consensus to terminate any further testing of the Dri-Water product based on its poor performance during the recent I-580 project field test and the fact that the landscape vegetation to be planted are typically determined by the contractor.

**Nevada Department of Transportation**  
1263 S. Stewart Street  
Carson City, NV 89712

First-Class  
U.S. Postage  
PAID  
Carson City, NV  
Permit No. 15



**Volume 14**

**Number 4**

The Research Division administers the Department's research, development and technology transfer program and serves as the "clearing-house" for product evaluations

### **Research and Technology Review**

Is published quarterly by the NDOT Research Division. Its purpose is to provide the latest information on the NDOT research activities including product evaluation and other pertinent research topics.

*The Nevada Department of Transportation*  
1263 S. Stewart Street  
Carson City, Nevada 89712

Governor, Kenny C. Guinn  
Jeff Fontaine, P.E., Director

If you have comments or need additional information regarding any of the topics discussed in this issue please contact the Research Division at (775) 888-7803.

