



RESEARCH AND TECHNOLOGY REVIEW

SUMMER 2007

SIGNAL CONTROL AND PHASING

Dr. Zong Tian, Principal Investigator and Assistant Professor of Transportation Engineering at the University of Nevada, Reno (UNR), noticed that a group of signals near the UNR campus were not timed efficiently. Applying his prior experience and knowledge in the area of traffic signal coordination, with emphasis in signalized diamond interchange operations, he realized that the signals near UNR actually possess geometry and traffic flow characteristics similar to diamond interchanges. Dr. Tian believed that significant improvement could be achieved if the signal control and phasing were modified.

While meeting with NDOT staffs and local agencies, he delivered the idea of how the signals could be better controlled using the diamond signal phasing concept. A research proposal based on this topic was successfully approved by the Nevada Department of Transportation (NDOT), and a major research effort was initiated.

The research team, led by Dr. Zong Tian

at UNR, evaluated the new signal phasing scheme using traffic simulation software. The signal control concept was presented at several meetings. Once the city officials were convinced, the new signal timing plan was implemented.

Based on the travel time runs for the periods before-after implementation of the diamond signal phasing, the proposed new timing reduced stops by 40%~60% and travel time by 25%~50%. The photograph below shows the before-after operations at the two signals on Virginia Street, where a significant reduction in queues and stops were noticed.

The six signals the research team worked on serve a major gateway for the City of Reno and UNR where traffic coming from I-80 funnels through these signals. The improvement in the operations can be clearly noticed by the drivers going through these signals on a daily basis. The success with signal coordination was reported twice by KTVN Channel 2 television.



INSIDE INFO

SIGNAL CONTROL AND PHASING 1

SAFETY IN WORK ZONE AREAS 1

PEC: BRIDGE DECK ERLAY FIELD ST 2

PEC: BRIDGE DECK CRACK SEALANT FIELD TEST 2

RESEARCH PROBLEM STATEMENTS FOR NDOT 3

PEC: FHWA PROCESS REVIEW REPORT 3

LIBRARY CORNER 4

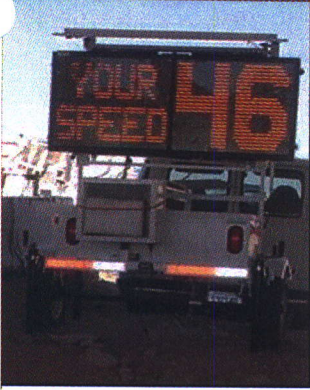
RESEARCH DAY 2007 4

BEFORE

AFTER



SPEEDING IN WORK ZONES AREAS



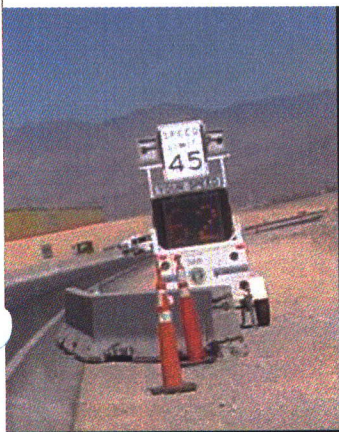
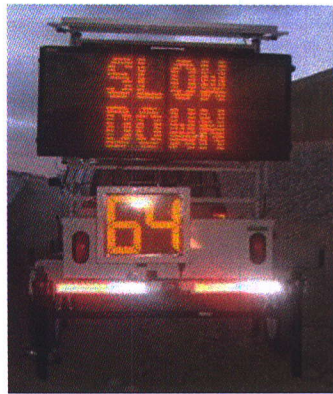
Nationwide, the number of people killed in work zone crashes has increased from 789 in 1995 to an all-time high of 1,093 in 2000. Also, more than 40,000 injuries occur as a result of crashes in work zones each year. With the trend of continuing rapid growth in Nevada, especially in Las Vegas, and the expansion of the transportation network, the number of

crashes in work zone areas will likely increase.

Speeding is a major contributor of crashes in work zones. To mitigate the problem, advanced technologies such as red-light cameras issuing citations to speeding vehicles, radar detectors measuring vehicle speeds, variable message signs displaying measured speeds or traffic information, and web sites for disseminating traffic information to a large region have been developed.

With the Evaluation of the Effectiveness of Advanced Technologies for Work Zones research project, Dr. Hualiang (Harry) Teng, Principal Investigator and Assistant Professor of the University of Nevada, Las Vegas, is testing Speed Monitoring Displays in work zones. One test site was located on CR-215

at Alexander Road in Clark County, (Southern) Nevada. Five field testing scenarios were: sign size, sign flashing rate, number of displays, warning message, and effectiveness over time. At the test site, traffic data such as speed, headway, and vehicle length were collected using Nu-Metrics detectors placed downstream of the speed monitoring display. These traffic data were available for each individual vehicle passing the speed monitoring display. The speeds and the percentage of speeding vehicles in these scenarios were compared with those when there was no speed monitoring displays operating. In the comparisons, hypothesis testing was used for three vehicle classes: car, single unit truck, and multi-unit truck. This determined the effectiveness of each scenario.



It was found that the speed monitoring device with the larger sign performed better than that with the smaller sign for all three types of traffic. The flashing of the speed sign and the static message "Slow Down" did not significantly improve the performance of the speed monitoring displays. Overall, speeds can be reduced from approximately 5 to 8 mph with deploying the speed monitoring displays. As a result, crashes will likely be reduced, and lives saved.

PRODUCT EVALUATION COMMITTEE

BRIDGE DECK OVERLAY FIELD TEST

The Bridge Division proposed a field test for two thin-bonded deck overlay systems. The objective of the systems is to waterproof the bridge decks. These types of products are considered for use for bridge deck rehabilitation projects where the Department's typical 3/4" polyester overlay is deemed to be impractical. It is anticipated these alternative overlay products will provide comparable waterproofing resistance and superior skid resistance.

There was a similar test on the Mill Street bridge in Reno three years ago. The Mill Street products passed the waterproofing function, but they ultimately failed because of low skid test values. The aggregate pulled away from the epoxy. All that was left was pitted epoxy, which produced the low skid test results. This new test has a better chance of passing because the proposed bridge receives much less traffic and minimal snow activity. These products are also thought to be of better quality than the products used on Mill Street.

If the products pass the field test, the less extreme environment will be noted. The project was approved and is proceeding.

BRIDGE DECK CRACK SEALANT FIELD TEST

The Bridge Division proposed a bridge deck crack sealant field test. The objective of this field study is to evaluate and compare the performance of various materials, either currently used or proposed, used for sealing and repairing cracks in bridge decks. The Nevada Department of Transportation (NDOT) specifications currently call for the use of high molecular weight methacrylate (HMWM) for crack sealing. It is anticipated that alternative products may offer comparable performance to HMWM along with additional cost and safety benefits. Any potential budget issues will be worked out with Materials, Bridge, and Research. Skid values should be measured in the evaluation of the sealants, but not on a pass/fail criteria. The field test will just monitor the sealant's effect. However, the field test was approved with the stipulation of adding skid value to the evaluation.

RESEARCH PROBLEM STATEMENTS FOR NDOT FY 2008 RESEARCH PROGRAM

The Research Division would like to thank the following people for submitting research problem statements for FY 2008 Research Program:

From NDOT: Dean Weitzel, Denise Inda, Gary Selmi, Heidi Wood, Joe Martinez, Kathleen Weaver, Lori Bellis, Lynn Purvis, Lynn Shomers, Michelle Gardner-Lilley, Mike Turner, Reed Gibby, Robert Anderson, Russ Law, Steve Merrill, Tim Mueller and Tracy Larkin-Thomason;

From RTC Southern Nevada: Jerry Duke;

From UNLV: Dr. Barbara Luke, Dr. Fatma Nasoz; Dr. Harry Teng, Ken Peck, Dr. Mohamed Kaseko, Dr. Moses Karakouzian, and Dr. Nader Ghafoori;

From UNR: Dr. Cahit Evrensel, Dr. David Sanders, Dr. Kwang Kim, Dr. Peter Weisberg, Dr. Raj Siddharthan, Dr. Robert Nowak, Dr. Yangyao Jiang, and Dr. Zong Tian; and

From Desert Research Institute: John Hallett.

Out of 33 research problem statements received, 15 were prioritized and selected for issuing requests for proposals. They are:

Project Title	Project #	Problem Statement Origin
Develop a System to Mitigate Reflective Cracking of Flexible Pavements-Phase III: Field Validation	01-08	UNR
Winter Maintenance Improvements, Phase II: Implementation, Design and Optimization	02-08	UNR
Impact of System Expansion on Maintenance Resources	03-08	NDOT
Policy Analysis of Licensing Elderly Drivers	04-08	NDOT
Investigation of Corrosion of MSE Walls in Nevada	05-08	UNR
Development of an Effective Roadside Vegetation Management Program	06-08	NDOT
Project Cost Estimation Methodology for Transportation Planning Activities- Phase 2-Develop Software	07-08	NDOT
Identify the Process for Updating NDOT's Specification for HMA Construction	08-08	UNR
Qualitative Risk Assessment for NDOT	09-08	NDOT
Evaluation of Asphalt Bridge Deck Joint Systems	10-08	UNLV
Feasibility of Using Technology for Transportation Infrastructure Management and Enforcement	11-08	UNLV
Tree Crown Mortality Associated with Roads in the Lake Tahoe Basin: A Remote Sensing Approach	12-08	UNR
Evaluation of Video Detection Systems and Development of Application Guidelines	13-08	UNR
Post-Earthquake Capacity and Assessment of Columns and Bridges	14-08	UNR
Analysis of Alternatives for Accommodating Trucks on Urban Freeways in Southern Nevada	15-08	NDOT/UTC-UNLV

FHWA PROCESS REVIEW REPORT

Research outlined some of the findings and recommendations from the Process Review. Each item was reviewed and discussed. A re-write of the March 6, 2003 memorandum regarding specifying proprietary products was also presented. The initial feedback from FHWA was that the draft memoran-

dum needed clarification. Several changes were identified and will be incorporated into the next draft version

Research Division
 1263 South Stewart Street
 Carson City, Nevada 89712
 Phone: 775-888-7223
 Fax: 775-888-7230
 E-mail: rclewell@dot.state.nv.us

Governor, Jim Gibbons
 Director, Susan Martinovich, P.E.

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



We are on the web!

<http://www.nevadadot.com/>

COMING SOON—RESEARCH DAY 2007

Research is excited about a new event being developed to present employees with a variety of research information. The theme will be:

RESEARCH PAVES THE ROAD TO SUCCESS.


August 20, 2007, in the 3rd Floor Conference Room at Headquarters

Research Day 2007 will include:

- Highlights from Implemented Research Projects.
- Information on Research Projects, Product Evaluation Program, and Library Services.
- Special Guest Speaker and other presentations will be announced.
- Informational UNR/UNLV Booths on Current Research Projects.

ADDITIONAL INFORMATION COMING SOON

LIBRARY CORNER

Heidi Wood, Research Librarian, emails an acquisition list monthly to NDOT employees that provides links to articles, newsletters, and lists reference materials added to NDOT's Research Library. Keep an  open.



AUGUST						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

ABOUT NDOT'S R & T REVIEW

The NDOT 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 information and other pertinent research topics.

If you have comments or need additional information regarding any of the topics discussed in this issue, please contact the Research Division.

Edited by Roma Clewell,
 Research Analyst