VOLUME 16, ISSUE 4

RESEARCH AND TECHNOLOGY REVIEW

FALL 2007

INSIDE THIS ISSUE:

INTERESTING TIDBIT

http://www.merkle.com/humanMemory.html

Thomas K. Landauer has studied the capacity of a human brain. The remarkable result of this work was that human beings remembered very nearly two bits per second under all the experimental conditions. Visual, verbal, musical, or whatever–two bits per second. Continued over a lifetime, this rate of memorization would produce somewhat over 10^9 bits, or a few hundred megabytes.

EXPLORING ALTERNATIVE STRATEGIES FOR THE REHABILITATION OF LOW VOLUME ROADS IN NEVADA

Due to Nevada's continuing growth, the Nevada Department of Transportation (NDOT) is faced with the challenge of how to balance available funding between pavement preservation and capacity improvement projects. This challenge is even greater for the low volume road network. The low volume road network consists of roads with traffic volumes up to 400 vehicles per day. There are 3,385 lane miles of low volume roads for which NDOT is responsible.

Milling Hauled to Windrow

In the past, NDOT has preserved the low volume road network with its conventional strategy of placing plant-mix bituminous surface overlay. This strategy, along with scheduled maintenance activities, has a service life of 20 years. If NDOT were to continue to use this method, the cost to maintain the network would be approximately $21 million per year. Since improving urban areas has been a priority for many years, the rural network has been deteriorating faster than rehabilitation is administered. Thus, more cost-effective methods for pavement rehabilitation must be developed for the Low Volume Road Pavement Preservation program.

A research project was initiated in 2001 to find more cost-effective strategies for preserving the low volume road network. The project was entitled, "Exploring Alternative Strategies for the Rehabilitation of Low Volume Roads in Nevada." The tasks included:

- Identify cost-effective rehabilitation strategies for low volume roads.
- Select project sites throughout the state to test identified strategies.
- Develop initial and life-cycle costs for each strategy.
- Produce guidelines for selecting the most cost-effective strategies for low volume road rehabilitation.

The collaborative effort of in-house personnel identified alternative rehabilitation strategies that showed potential for preserving the low volume road network at a cost savings. These strategies included full depth reclamation, cold mixes, cold in-place recycle using assorted rejuvenators, and numerous surface treatments. A total of 29 combinations of pavement surface and structural rehabilitation strategies were constructed on 111 centerline miles of test sections throughout the state. The strategies were constructed on portions of SR230, US6, SR226, SR168, and SR892. The test sections are being evaluated using standard engineering practices and the preliminary results are encouraging.

Windrow is Recycled

The construction of the test sections resulted in improved specifications, construction experience with new rehabilitation methods and products, and potential for maintaining the network at substantial cost saving. A review of life-cycle costs for the alternative rehabilitation strategies show

Continued on Page 2

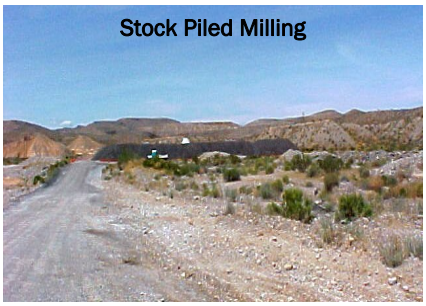
LOW VOLUME ROADS CONTINUED

Paver Completes 3 Inch Recycled Pavement Structure

that cost savings of $38,000 to $104,000 per centerline mile can be realized if strategies other than plantmix bituminous surface overlay were used to rehabilitate the low volume road network. There is a potential network level saving of $8.4 million per year if alternative strategies are used.

The research team developed guidelines recommending rehabilitation methods that will provide durable and safe roadways for the traveling public at substantial cost saving. These guidelines are intended for decision makers tasked with managing the network with limited budgets. Choosing appropriate rehabilitation strategies for roads with different types of distresses and deficiencies are difficult and use of improper strategies will result in financial loss or cause premature failures. The use of these guidelines will help maximize investment in the low volume road network.

Stock Piled Milling



FY2008 NEW RESEARCH PROJECTS

Winter Maintenance Improvements (Phase II): The purpose of this study is to implement the technologies (e.g. airfoil and air blower systems) identified during phase I of the research to improve snow plowing visibility including driver's visibility and vehicle visibility. The principal investigator: Dr. Cahit Evrensel (UNR).

Investigation of Corrosion of Mechanically Stabilized Earth (MSE) Walls in Nevada: The proposed research is to develop an inventory of MSE walls and to identify the extent of corrosion problems associated with MSE wall reinforcing elements. The principal investigators: Dr. Raj Siddharthan (UNR) and Dr. Barbara Luke (UNLV).

Evaluation of Asphalt Bridge Deck Joint Systems: This proposed research will investigate the failures of bridge deck joint systems, compile information on available products and develop a plan for laboratory and field evaluations of these systems. The principal investigators: Dr. Nader Ghafoori and Dr. Moses Karakouzian (UNLV).

Impact of System Expansion on Maintenance Resources: The objective of this research is to develop a policy and some analytical tools to assist NDOT maintenance managers to analyze the distribution of manpower, equipment, and materials over the life cycle of transportation systems. The principal investigator: Dr. Harry Teng (UNLV).

Evaluation of Video Detection Systems and Development of Application Guidelines at Signalized Intersections: This research is proposed to evaluate various video detection systems deployed in Nevada urban areas and to develop an application guideline to improve their detection accuracy. It is a cooperative research project with the Regional Transportation Commission (RTC) of Southern Nevada and RTC of Washoe County. The principal investigator: Dr. Tian Zong (UNR).

Analysis of Alternatives for Accommodating Trucks on Urban Freeways in Southern Nevada: The research proposed is to evaluate different operational strategies for accommodating trucks in Las Vegas. Both field observations and traffic simulation will be conducted to assess the impacts of different truck strategies on mobility and safety. It is a cooperative research project with the University Transportation Center (UTC) at UNLV and RTC of Southern Nevada. The principal investigator: Dr. Harry Teng (UNLV).

Tree Crown Mortality associated with roads in the Lake Tahoe Basin- A Remote Sensing Approach: This research is proposed to use satellite imagery to study the roadside vegetation health in the Lake Tahoe area. The principal investigators: Dr. Peter Weisberg and Dr. Bob Nowak (UNR).

RESEARCH DAY—A GREAT SUCCESS

Research Division Hosted
RESEARCH DAY
on August 20, 2007

NDOT's Director, Susan Martinovich, P.E., kicked off the event. The theme of the event was "Research Paves the Road for Success".

Specific research elements were discussed by the following speakers: Tie He, Chief of Research; Reed Gibby, Research Coordinator; Jason Van Havel, Product Evaluation Coordinator; and Heidi Wood, Research Librarian. Principal Investigators added information on past and present projects. These speakers included Dr. Cahit Evrensel, Dr. Harry Teng, Dr. Tian Zong, Dr. Bob Nowak, Elie Hajji, and Dr. Nader Ghafoori.

Approximately 125 individuals attended Research Day. Other activities included booth presentations by the University of Nevada, Reno and Las Vegas. A drawing for books at the end of the day concluded the activities.

This event will be hosted again next year. It is hoped that even more employees chose to participate and become actively involved with the Research Department. We are here to enhance your deliverables.

PRODUCT EVALUATION COMMITTEE ACTIVITIES

FILTRONA BARRIER RAIL MARKER

In the June 2007 Product Evaluation Committee meeting, the Filtrona Barrier Rail Marker was considered for removal from the Qualified Product List (QPL). The initial reports from the field showed a distressing number of failures that led to a closer field inspection revealing several of the markers had become detached. This was attributed to poor installation practices because the markers were not installed according to the manufactures recommendations. It appeared that several of the markers were installed with liquid nails, and not the recommended epoxy. The liquid nails lost adhesion with the concrete, and the markers became detached. Some of the markers were broken. Most of the broken markers were isolated in a single area. It was theorized that a vehicle with a protrusion or an aggressive snow plow is to blame for these broken markers. After discussing the issue, the Product Evaluation Committee decided to leave the Filtrona Barrier Rail Marker on the QPL.

NTPEP PANELS

Reed Gibby provided a list of National Transportation Product Evaluation Program (NTPEP) Panels and encouraged those interested in participating as a panel member to apply by sending him an email of interest and a copy of their resume to agibby@dot.state.nv.us.

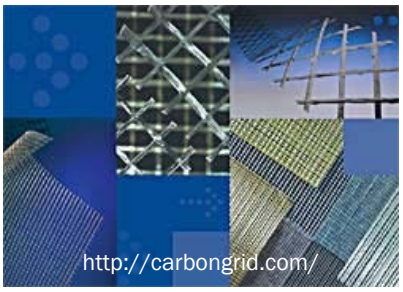
NTPEP has been growing for the last 10 years. Additional information can be found at their web site, http://www.ntpep.org, including a data mine of test results for a wide range of projects.

Scott Thorson shared his experience as the Vice Chairman of the Snow Plowable Pavement Markings. The position has provided Scott with an opportunity to meet people who share similar interests and concerns from all over the country.

PENDING FIELD TESTS STATUS

Research presented a number of approved field tests that had not proceeded. The intent was to determine the status of the field tests and their likelihood of still proceeding.

- ConArch is waiting for an applicable project. The crack seal and bridge overlay tests are being developed and are proceeding nicely.
- Tech Fab is equivalent to Glass Grid and is often interchanged. The Tech Fab product will be field tested when an applicable project is identified.



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LIBRARY CORNER

This fall, I would like to remind you to visit the Research Library. Whenever it's finally cold and wet outside, think about coming into the Research Library for a magazine or journal; some of them are really fun to look at, such as: Landscape Architecture, Civil Engineering, Nevada Magazine, ENR, and many more. The library is located in room 115, on the first floor of the NDOT Headquarters building - open 8-5, Monday through Friday. Once you stop in and see our collection, you will get a better idea of what information we carry; mostly federal and state information, but also study materials and most NDOT divisional information.

November 4, 2007, don't forget to "fall back", for details: http://webexhibits.org/daylightsaving/b.html

The Research Library is also a place where you can request information, such as a literature search, or acquire a specific report. You may also place an order for book purchases or orders from other libraries and/or approved publishers.

Please send your requests to, Heidi Wood, in the Research Library, at hwood@dot.state.nv.us , or call me at ext. 7895. And as always, remember,

I send any book - anywhere in Nevada.

Thank you for all your questions this month!

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,
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