

# Research and Technology REVIEW

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RESEARCH DIVISION

## Research Bulletin

### Three New Research Projects Added to the NDOT FY 2004 R, D&T Program

Approved by the NDOT Research Management Committee, three new projects have been added to the NDOT FY 2004 Research, Development and Technology Transfer (R, D&T) program. Among the three projects approved, two were initiated internally and will be conducted as in-house projects. The other project is for the funding of a project that is included in the FY2004 National Cooperative Highway Research Program (NCHRP) as an Innovations Deserving Exploratory Analysis (IDEA) project. The purpose and scope of these three projects are as follows:

**1) Fiber-Reinforced Plastics for Seismic Bridge Restrainers:** The primary objective of the proposed study is to explore the effectiveness of fiber-reinforced plastic (FRP) fabrics used as seismic restrainers at bridge hinges and abutments.

The study will be conducted on full-scale models of in-span hinges using one of the shake tables at the University of Nevada, Reno. Researchers will study different possible types of FRP restrainers and develop design guidelines that bridge engineers can use. Dr. M. "Saïd" Saiidi will be the principal investigator for this research.

**2) Application and Evaluation of Centerline Rumble Strips in Nevada** (in-house research):

The proposed research will focus on implementing centerline rumble strips in Nevada with respect to placement, operational safety effects, cost, and service life.

**3) Experimental Study on Installing Tilted Signs to Prevent Snow Accretion on Sign Surfaces** (in-house research): The study will consist of installing ground-mounted signs at various angles along with a control section of vertical signs. During and immediately after snow storms, evaluations will be made and documented to determine the effectiveness of tilting signs in snow prone areas to prevent snow accretion on sign surfaces.

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For the two in-house projects, Denise Inda, NDOT District II Traffic Engineer, Tom Lumpkin, NDOT District II Highway Maintenance Supervisor, along with Tie He, NDOT Research Coordinator, will serve as the principal investigators. A project panel for each project will be established to direct the project and monitor its progress.



**NDOT RESEARCH:**

***Evaluation of Erosion Control Strategies along US Highway 50 in the Clear Creek Watershed***

Severe erosion is occurring at several locations in the Clear Creek watershed along U.S. Highway 50 between Carson City and Lake Tahoe. Surface water runoff from seasonal snowmelt and infrequent high intensity rain events causes erosion resulting in the transport of substantial quantities of soil and sediment. Erosion has caused problems related to slope stability along roadways and increased maintenance requirements, especially those associated with drainage structures.



*Uncontrolled erosion at culvert outlet*

Corrective action must be taken to limit the erosion of soil and transport of sediment during runoff events. Six different rolled erosion control products (RECPs) that are used for channel protection will be evaluated during this project. These RECPs included fabrics with straw, coconut fibers, polyolefin fibers, and polypropylene filaments.

The project includes a combination of laboratory tests and field studies designed to evaluate product performance in a relatively short timeframe. The laboratory tests were conducted using a recirculating tilting flume in the hydraulics laboratory in the Department of Civil Engineering at the University of Nevada in Reno. Each RECP was evaluated under flow conditions ranging from 500 gallons per minute (gpm) up to 4500 gpm. Results demonstrated that the RECPs could reduce the erosion of the unprotected bare soil by a magnitude of three (i.e., by up to 1000 times). In general, RECPs with more rigid structure appeared to perform slightly better than others that were more flexible, most likely because they reduced the occurrence of “water piping” between the soil and channel lining. The results of the laboratory studies

were used as the basis for the selection of RECPs to be evaluated during field-testing.

Field-testing will enable the performance of RECPs to be monitored under actual field conditions during the winter and spring months when the majority of the runoff events occur. Test plots have been constructed in a channel within the Clear Creek watershed that has experienced severe erosion. Each field plot is 25-feet long and is preceded with a drop structure to reduce the extreme slope of the channel. The two-foot high drop structures were constructed using treated timber. A five-foot riprap apron was placed below each drop structure to dissipate energy at the upstream end of each test section. The riprap aprons also act as an anchoring device to secure the leading edge of the RECPs. The field performance of four different RECPs is being evaluated.



*Typical channel test section after channel stabilization and installation of channel lining*

Based on the results of the laboratory flume studies and the anticipated performance of these products in the test plots, it appears that RECPs will offer an economical solution to substantially reduce the erosion in both slope and channel applications in the Clear Creek watershed. For more information about the project, please contact Dr. Keith Dennett via e-mail at [kdennett@unr.com](mailto:kdennett@unr.com).



*Dr. Keith Dennett*

# Product Evaluation Committee (PEC) Meeting Recap

## APPROVED

### QPLs for preformed retroreflective pavement marking tape for extended life

To ensure that permanent pavement marking tape used on NDOT projects meets the latest ASTM D4505-01 standards, the Traffic/Safety Division revised specifications for these products covered under section 732 of NDOT Standard Specifications.

Under the updated specifications, permanent tapes are identified as having reflectivity levels I or II, class 1, 2 and 3 and skid resistance levels A or B (see table).

In the past, NDOT established QPLs for thermoplastic pavement striping (both hot-applied and

preformed thermoplastic) and temporary tapes to help the State Purchasing Division in the bidding process and to provide quality control over usage of pavement striping materials for the department. Based on Traffic's request, the PEC approved establishment of the QPLs for three permanent marking tapes types under respective subsections numbers. Currently, these QPLs include products already approved and used by NDOT:

Stamark 380, 5730 and 420 tapes from 3M and series 300 and 400 tapes from Advanced Traffic Markings. In the future, vendors/manufacturers of permanent pavement striping tapes will be directed to apply for acceptance under current NDOT specifications. Should their product comply with NDOT requirements, based on Traffic's recommendation, it can be added to the QPLs for permanent pavement striping tapes.

Reflectivity Level (ASTM D4505-01)	Class (ASTM D4505-01)	Skid Resistance Level (ASTM D4505-01)	Pavement Marking Tape Type
II (250 mcd/m <sup>2</sup> /1X for white tape and 175 mcd/m <sup>2</sup> /1X for yellow tape)	1, 2 and 3 (with or without precoated adhesive)	A (45 BPN)	Type 1
II (250 mcd/m <sup>2</sup> /1X for white tape and 175 mcd/m <sup>2</sup> /1X for yellow tape)	1, 2 and 3 (with or without precoated adhesive)	B (55 BPN)	Type 2
I (500 mcd/m <sup>2</sup> /1X for white tape and 300 mcd/m <sup>2</sup> /1X for yellow tape)	1, 2 and 3 (with or without precoated adhesive)	A (45 BPN)	Type 4



## APPROVED

### Field test of all-in-one bag asphaltic plug joint system from Pavetech

In response to a Bridge Division recommendation, the PEC approved a field test of the Matrix One asphaltic plug joint system for construction and maintenance applications.

The Matrix One asphaltic plug expansion joint system is an all-in-one version of the Matrix 502 asphaltic plug joint system that is already approved and used by NDOT. Matrix One is a premeasured mixture of Matrix 502 comprised of a highly flexible polymeric binder, blended fibers, special elastomers and graded gabbro aggregate

packaged in box. This version eliminates the need for a separate mixing of components on-site. The product is designed for the repair and maintenance of small movement bridge expansion joints.

Bridge Division staff reviewed the product literature for the Matrix One joint system and recommended a trial installation prior to consideration for placement on the QPL. The trial installation is considered necessary to ensure that the Matrix One asphaltic plug joint system, composed of prepackaged materials, will provide equal or better performance when compared to the conventional asphaltic plug joint systems composed of site blended materials. If successful, the Matrix One asphaltic expansion joint system will be added to the QPL under section 502.02.01 for asphaltic plug joints



**APPROVED**

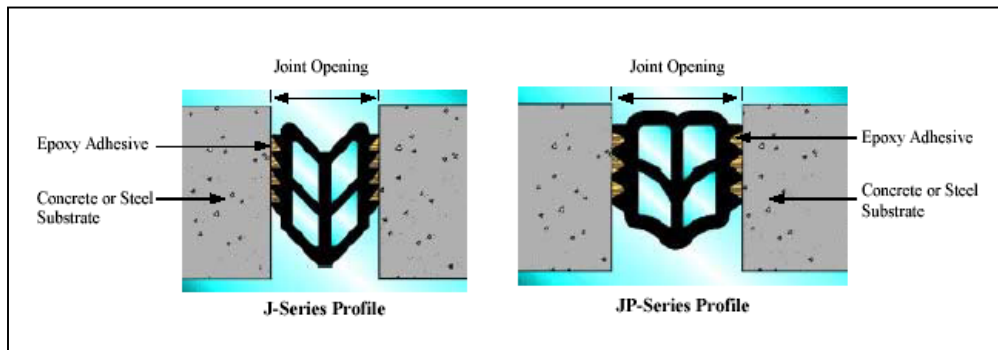
**Field test of neoprene compression seals from DS Brown**

The PEC approved a request from DS Brown for a field test of their “J” and “JP” series neoprene compression seals. These seals are similar to a seal already approved and listed in the QPL – JEENE structural and sealing joint from Watson Bowman Acme Corporation. The committee suggested that Bridge and Maintenance identify appropriate projects to ensure that these seals are tested for both new construction and maintenance applications.

The “J” and “JP” series profiles include an extruded

elastomeric profile and a high-strength, two-part epoxy based structural adhesive. These products seal the opening from the intrusion of water and debris when inserted into an expansion joint in a substrate. The design of these seals allows them to function under compression as well as under tension. The seal profiles are extruded from polychloroprene (neoprene) material meeting ASTM D3542. The material has a minimum 2,000 psi tensile strength requirement and 225% elongation at break. The profiles are constructed so that their cross-section features a multi-celled web design that exerts a constant

pressure to the joint wall interfaces. The adhesive is a high-strength, two-part modified epoxy-based material. It is 100% reactive and develops a strong bond in approximately 24 hours. In summary, the “J” and “JP” seals feature the following: 1) the seals are inserted by using a vacuum. Once the vacuum is released, the air pressure returns to normal and compresses the sidewalls against the concrete surfaces; 2) concrete and steel adhesive is VOC compliant, the materials resist humidity, salt spray and extreme temperature ranges; 3) fatigue was tested for one million cycles; and 4) no block-out recess is required.



Arizona, Kentucky, West Virginia and Illinois have approved these products. New Jersey is testing these seals under an experimental program.



**Qualified Products List (QPL) update**

The QPL can now be accessed on the Nevada DOT web site using the following link:

[http://www.nevadadot.com/reports\\_pubs/research/pdf/QPL.pdf](http://www.nevadadot.com/reports_pubs/research/pdf/QPL.pdf)

Also, the QPL is linked to the Roadway Design web page and can be viewed along with Standards and Manuals located on the Design page.

Please be aware that contractors are required to use the actual dated QPL specified and listed in the contract Special Provisions under the “Notice to Contractors.” This dated QPL is distributed to the contractors along with contract documents.

The QPL is compiled by the NDOT Research Division. Products will remain on the QPL

as long as their performance is satisfactory. Poor performance in the field will result in a product’s suspension and/or removal at any time from the QPL in accordance with established NDOT product evaluation procedures. The evaluation of a product listed on the QPL does not constitute an endorsement by the Department, nor does it imply a commitment to purchase, recommend, or specify the product in the future.

Should you have any questions regarding the QPL and/or product evaluation process please contact Masha Wilson, NDOT Product Evaluation Coordinator at 775-888-7894 or via email at [mwilson@dot.state.nv.us](mailto:mwilson@dot.state.nv.us)

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

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