

RESEARCH AND TECHNOLOGY

REVIEW

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SPOTLIGHT ON RESEARCH PROJECTS IN PROGRESS

FISCAL YEAR 1998 RESEARCH PROJECTS

Based on recommendations from the NDOT Research Advisory Committee, the department's Research Management Committee has committed funding to six new research projects for FY 1998. These projects will add to seven ongoing research projects that the department is currently involved in through contracts and pooled-fund commitments. Following is a complete list of NDOT's current research projects:

New Research Projects

- Electrochemical Properties and Reactions at the Surfaces and Interfaces of Concrete Aggregate, Cement and Mineral Admixtures (National Pooled-Fund Study)

- Optimal Acceptance Procedures for Statistical Construction Specifications (National Pooled-Fund Study)
- Performance of Lime in Hot Mix Asphalt Pavements
- Development and Application of a GIS Methodology for Statewide Accident Record Analysis
- High Performance Concrete Using Nevada Aggregates
- Evaluation of Mid-Block Crash Patterns and Countermeasures

Ongoing Research Projects

- Roadside Safety Hardware Crash Tested to NCHRP Report 350 Criteria (National Pooled-Fund Study)
- Development of a New Guardrail End Terminal Treatment, Phase II (Regional Pooled-Fund Study)
- Characterization of Nevada's Binders and Low-Temperature Properties of Mixtures Using SHRP Tests - Part II
- Study of Freeze/Thaw Performance of Permeable Base Course Layers Beneath Rigid Pavements
- A Review of Flared Bridge Columns in the State of Nevada, and Design Recommendations

1997 WASHTO RAC MEETING

Regional AASHTO Research Advisory Committees (RAC) meet biennially, with a National RAC meeting held during alternate years. This year's Region IV (WASHTO) RAC meeting was held in Cody, Wyoming. NDOT's representative for this meeting was Alan Hilton, the department's Research Manager.

With membership from all 52 member departments, the AASHTO RAC provides a state perspective regarding regional and national research concerns, in their advisory role to the AASHTO Standing Committee on Research (SCOR). Topics of discussion during this year's WASHTO RAC meeting included "hot" FHWA research, various reauthorization bills, NCHRP projects, FHWA technology deployment, an overview of the WesTrack project, the Research-In-Progress database, pooled-fund research projects, and the experiences of several WASHTO states that have

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**Product Evaluation Committee
PEC RECAP
Sept 9, 1997**

FIELD TEST

Sign Support Bases for Small Signs - Breakaway and Slipbase Designs

Due to ongoing "wind walking" problems with our current sign support slipbase design, the PEC initiated a field test of four different sign support base designs for small signs. This test will include: our currently-approved, non-proprietary triangular slipbase design; a modification of this design; and two base designs using the NDOT-approved proprietary Dent breakaway bolt.

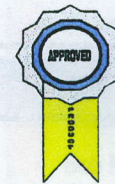
While the NDOT-approved slipbase design meets current federal crash testing requirements, its performance depends on a bolt torquing requirement that is extremely difficult to maintain over time. Due to high maintenance

costs to ensure proper torquing, and the high failure rate of this design in windy areas, District 2 has adopted a modification of this design using higher quality bolts and washers along with a nylon-insert locknut. District two believes that the use of this locknut prevents the nuts and bolts from loosening, which allows maintenance crews to keep their signs from falling while also maintaining the proper torquing requirements necessary for safe crash performance.

Based on an earlier review of this "wind walking" problem, the Dent breakaway bolt was approved by the PEC in March 1996. Its use, to date, has been limited to a test installation in Wahoe Valley, just north of Carson City. While the Dent bolt did not perform well during this test, it is believed that the bolt may have been damaged during this test installation. In addition, the Dent breakaway bolt was designed and tested to be used with a drilled baseplate, not with the slotted base used during the Washoe Valley field test. It is due to the Dent Bolt's simplicity, its proven crash worthiness, and its omni-directional breakaway characteristics, that the PEC included it in this field test as a potential alternate to the current design. It will be installed with both the triangular slotted baseplate to determine its performance for retrofit installations, and with a drilled baseplate to determine its performance for new installations.

Located in windy Washoe Valley, this field test provides an excellent opportunity to determine the in-service performance of federally-approved slipbase and breakaway

base designs. In addition, it will provide test data on the slipbase modifications developed and adopted by District 2. ☼



APPROVED

**Syro MPS-350 III
NCHRP 350-
Approved Truck-
Mounted Attenuator**

The NCHRP Report 350 has had a tremendous impact on the types of roadside devices evaluated and approved for use in recent years. Along with many other state transportation agencies, NDOT has worked diligently to ensure that roadside devices used on our highways provide the highest possible safety performance; the NCHRP 350 crash testing criteria have improved our ability to do so. Having recently adopted NCHRP 350 crash testing criteria as our primary requirement for roadside attenuating devices, NDOT has now revised the Standard Specifications for truck-mounted attenuators to accept only those which meet test level three as described in the NCHRP 350 guidelines.

Mr. Chuck Norton, Syro, Inc. representative, provided a presentation and answered questions concerning their new MPS-350 III truck-mounted attenuator (TMA). Mr. Norton explained that unlike their competition, the MPS-350 III does not use a replaceable cartridge design to dissipate the energy of

impacting vehicle. Instead, their new TMA incorporates a unique new steel truss design that dissipates energy through a metal-shearing action when impacted. Additional claims for this new design are: reduced cost of replacement parts; resistance to moisture, deterioration and sagging; easily repaired; and unaffected by minor "nuisance" hits.

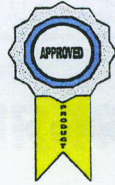
The crash testing performance of this new design has recently received FHWA approval under the NCHRP 350 Test Level 3 crash testing criteria. Test Level 3 of the NCHRP 350 testing guidelines, requires attenuating devices to withstand the impact of vehicles ranging from a small passenger vehicle (1800-pound car) to a heavy passenger vehicle (4400-pound, 3/4 ton pickup truck) traveling at speeds up to 62 MPH. Beyond considering the structural adequacy of a TMA, NCHRP 350 crash testing criteria also consider the risks to occupants, and the roll-ahead distance of the supporting truck.

Based on Mr. Norton's presentation, a thorough review of the product literature and the department's needs, the PEC approved specification revisions to require NCHRP 350 TL-3 approval for all TMAs used on NDOT projects. The committee expects that this revision will provide a superior TMA to highway workers across Nevada, while also giving the department a specification based on performance requirements rather than design.

Shortly after adopting the revised TMA specification, Energy

Absorption's Alpha 100K TMA was added to our new list of approved truck-mounted attenuators based on its conformance with the NCHRP 350 TL-3 requirements. ☼

APPROVED



Epoxy Industries' EvaZote 380 Pre-formed Foam Joint Sealant

After a five-year field test, Epoxy Industries' EvaZote 380 E.V.A. foam has been approved for use in growth joints on NDOT bridge projects. This approval was based on a recommendation from the principal investigator, Peter Booth, NDOT's concrete engineer.

EvaZote 380 is a proprietary ethyl vinyl acetate (E.V.A.) foam manufactured by Zote Foams of Britain and distributed solely by Epoxy Industries. It differs from other E.V.A. foams in its use of a proprietary UV inhibitor that gives it a characteristic bronze or tan color, rather than the grey to black color of other E.V.A. foams that contain carbon-black as their UV-inhibiting agent.

During the five-year testing of EvaZote 380, the pavement growth joint opening where it was installed, had shrunk from an initial width of four (4) inches down to two and one half (2 1/2) inches. As a result, the surface of the foam was wrinkled under compression, but it remained in tact and continued to perform its function. A sample of the material revealed some weathering and

roughness, however, the material beneath the top quarter (1/4) inch appeared unaffected by the environment. Similar results have also been observed on a number of other NDOT bridges where this product has been installed during the past five years.

Based on the performance of this product and a thorough review of E.V.A. foams currently marketed, Peter Booth is developing a generic Standard Specification for E.V.A. foams to be used in pavement growth joint applications. ☼

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recently completed a peer exchange of their state research programs.

While each of these topics generated a good deal of interest and discussion, the impact of various reauthorization bills and overview of the WesTrack pavement testing project appeared to spark the greatest amount of discussion.

Reauthorization of the current highway bill has received a great deal of press throughout the country on many levels. Regarding transportation-related research, the different reauthorization bills being presented, appear to retain most if not all of the current research programs, which is a relief for those in the business.

Nearing the end of its initially-

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planned term, test results from the WestTrack pavement testing program have sparked a great deal of discussion regarding the rutting that has occurred in the SUPERPAVE course aggregate test sections (test-level 1 mix design). Discussion continues regarding the implications of these findings and their causes, and we're sure to see more on this subject in the months to come. Also noted was an interest by FHWA in promoting the use of the facilities at the Nevada Automotive Test Center for a second phase to the Westtrack project. States interested in pursuing various research projects will be required to contribute 50 percent of the necessary funding.

If Hilton's experience was typical, the topics discussed and the sharing of information during this meeting provided new perspectives and stronger relations for everyone involved. *

1998 Research

(continued from page 1)

- In-Situ Stiffness and Damping of Spread Footings and Pile Foundations in Bridges In Northern Nevada
- Evaluation Of Rehabilitation Techniques For Flexible and Rigid Pavements In Nevada
- Development Of Pavement Performance Analysis and Procedures. *

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If you have comments, questions, or need additional information regarding any of the topics discussed in this issue, please contact Alan Hilton, Research/Special Studies Manager, at (702) 888-7803



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