

# RESEARCH AND TECHNOLOGY

# REVIEW

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RESEARCH DIVISION

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## RESEARCH BULLETIN

### Goals Set for a Robust Research Program

As identified by the National Cooperative Highway Research Program (NCHRP) Synthesis 280, the single most important factor in the achievement of a robust research program is support from top management. Top management is predisposed towards research and understands the contribution research can make to achieving organizational goals, and provides sufficient resources along with requiring accountability from the research program, will ensure a strong research program. In light of these views, the Research

Division recently met with top management, in NDOT's case, the department's Research Management Committee (deputy director and assistant directors). The committee was presented with an overview of the NDOT research program and briefed on the contents of the current R,D&T work program. With the ultimate goal of building a robust research program in mind, the following objectives were set for the program:

- 1) Promote better understanding and benefits of research program department-wide;
- 2) Increase technical and field staff involvement with problem statements;
- 3) Diversify the research program to reflect other areas such as maintenance, safety/traffic and policy research, outside of pooled-fund studies;
- 4) Focus on short-term, well-defined activities such as development and/or implementation studies;
- 5) Improve project management through Research involvement in technical oversight panels;
- 6) Develop an in-house research program; and
- 7) Implement performance measures for the research program and enhance program accountability. ☺

### Assessing Applicability of the SuperPave Mix Design System to Nevada's Conditions

The combination of extreme pavement temperatures and traffic conditions in Nevada presents a challenge for NDOT to implement the SuperPave technology. To address some concerns in the implementation of the SuperPave design system to Nevada's unique environmental and traffic conditions, a research project was initiated in 1998 to compare the performance of SuperPave hot mixed asphalt (HMA) mixtures with the NDOT standard Hveem HMA mixtures, specifically in terms of asphalt binder properties and content, aggregate gradation, volumetric properties, in-place compaction and in-place air voids.

Four test sections were constructed on I-80 east of Reno, Nevada in the westbound travel lanes during the month of September 1998. Two sections were designed with the SuperPave volumetric mix design method and two sections were designed using the Hveem design method. Two different binders were used: AC-20P and PG64-22. Each binder was used with a SuperPave designed mix and an Hveem designed

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mix, which resulted in the four sections being placed in series to be evaluated under similar environmental and traffic conditions. The SuperPave mix designs were developed in the University of Nevada's Pavement/Materials Laboratory while the Hveem mix designs were developed in NDOT's Materials Division. Materials testing and evaluation were conducted before, during and after the construction activities. Aggregates, binders and mixtures were tested for their conformance with the SuperPave and Hveem mix design specifications.

Based on the test results, it was determined that the asphalt binders used on the test sections consistently conformed to the specified grades through the entire construction activities. The in-place compaction data indicate that the SuperPave mixtures with both the AC-20P and the PG64-22 binders experienced some tenderness and moving under the roller. This behavior of the SuperPave mixtures has resulted in two problems: a) additional roller passes were needed to achieve a constant density and b) the bottom lift became over-compacted as the top lift was being rolled. Additional laboratory testing is currently being conducted on laboratory-prepared mixtures and field-prepared mixtures to assess the resistance of the mixtures to failure modes of rutting, low temperature cracking, fatigue, and moisture damage. The construction and post-construction laboratory testing will be coupled with the field performance of the test sections to

assess the applicability of the SuperPave volumetric mix design method under Nevada's conditions. *(The report is available for loan from the Research Division.)* Ⓢ

**Research Goes the Extra Mile**

As a part of the effort to increase awareness of the research program, Research Division staff traveled to the outlying districts to discuss the potential benefits of research and more importantly, to determine their research needs in relation to next year's R, D & T work program. As a result of these meetings, research problem statements will be developed for the evaluation/implementation of a fixed broadcast anti-icing system, an advanced commuter-warning system for the U.S. 395 corridor from Minden to Reno, and a problem statement will be written on crack-filling materials/procedures. Together with other research problem statements generated from the initial internal solicitation, they will be considered for inclusion in the R, D & T work program. Based on the response, Research staff will continue periodic visits to the districts and other maintenance stations to keep abreast of operational concerns and to generate ideas for potential research projects.

In addition to the in-state travel to enhance the program, NDOT staff also traveled to Salem, Oregon to meet with Research Manager, Bernie Jones and his staff. The primary purpose was to tour the Oregon DOT library to gather information on the library's collection, automation in terms of software and relative size in comparison to the planned NDOT library. Also on the agenda in Salem was a discussion of research management processes employed by each DOT and

common research interests that could potentially lead to regional pooled-fund projects. After the meeting, both sides expressed an interest in having more such meetings in the future and possibly including other bordering states such as Idaho or California. Ⓢ

**How can a Product be Removed from a QPL?**

The department's Research Manual includes a formal procedure for removing a poorly performing product or a product rendered technologically obsolete from a qualified product list (QPL). The first step is to contact the Research Division and have the problem(s) documented through the completion of a product review form. In the case of an emergency situation with regard to safety, the division/district may immediately terminate use of a product pending further review.

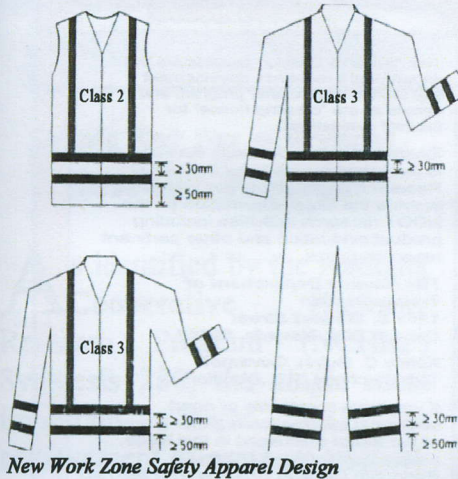
Upon receiving the product review form, the Research Division reviews the documentation, surveys other users of the product, and then presents a product summary to the Product Evaluation Committee (PEC). Based on the information provided, the PEC makes a recommendation on product use, i.e., limit the product's use, suspend usage indefinitely, remove the product from the appropriate list and/or revise the specification. As with all PEC decisions, the final decision is under the purview of the Deputy Director in consultation with the affected division's assistant director, if applicable. The vendor and the initiating district/division are notified of the final decision.

*(continued on page 4)*

## Specification Revisions

### High-Visibility Safety Apparel

Based on Traffic Engineering's proposal to improve the conspicuity



*New Work Zone Safety Apparel Design*

of work-zone safety apparel (vests, jackets, jumpsuits), the PEC adopted recommendations put forth in the "American National Standard for High-Visibility Safety Apparel" (ANSI/ISEA 107) dated June 1, 1999. The new NDOT specifications are:



*High visibility vests in nighttime work environment*

1) all vests shall meet requirements of Class 2 garments; 2) the background material shall be solid,

no mesh material will be allowed; 3) the color of the background material shall be fluorescent orange-red, fluorescent red or fluorescent yellow-green for all workers; 4) the background color for flaggers shall be fluorescent yellow green; and 5) for nighttime operations, all flaggers must wear conspicuity class 3 garments which are either jackets or coveralls/jumpsuits.⊕

## Approved

### QPL's for PCCP Crack Sealers and Epoxy Anchoring Systems

Based on a recommendation from the Materials Division, the PEC approved QPLs for epoxy anchoring systems and crack sealers. Epoxy anchoring systems will be placed under NDOT current specification, section 728, and PCCP crack sealers will be under section 409.03.09. In the past, these types of products were approved on a case-by-case basis but never formalized in an approved product list. However, with the advent of the QPL, past approvals issued by the Materials Division will be formally listed in a QPL for each respective specification. Additional anchoring systems and/or crack sealers submitted for evaluation under current specifications may be added to the QPL at the discretion of Materials.

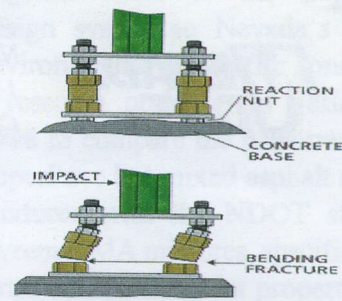
In addition, Research was asked to work with Structures, Materials and Specifications to determine the need for revising the specifications to

separate epoxy injection from the use of approved crack sealers, since the current specification permits the use of crack sealers in lieu of epoxy injection to seal cracks.⊕

## Field Test

### Manitoba Safety Base, Ltd. Breakaway Coupling for Light Poles

The PEC approved a field test of the Manitoba Safety Base breakaway couplings (Model 34M) based on its potential for effective performance and cost savings. The objective of the test is to determine wind loading and corrosion resistance. If successful, the test may lead to development of specification and establishment of a qualified product list for this type of product.



*Manitoba Safety Base breakaway couplings*

The Safety Base couplings for light poles are considered to be an effective impact-altering device, utilizing crashworthy frangible couplers to attach a pole to the base. The couplers can withstand external bending and torque imposed by static forces and by wind loads; however, they will fracture from an impact force. Also, the anchor bolts of this device remain intact after impact and the couplers can be easily removed and replaced with a new coupler set.

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Product failure is complicated and can be due to many factors such as materials, configuration/application or even a bad batch. This internal evaluation procedure ensures the department and the vendor that a thorough review is undertaken to determine the specifics of a product failure, inform the users about the problem, find a suitable solution and make necessary corrections including revising specifications to prevent it from happening again.★

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The couplings have been installed in Canada and have been approved for use by DOTs in Rhode Island,

Maine, Alaska and New York. They conform to 1985 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and comply with the NCHRP (National Cooperative Highway Research Program) Report 350 requirements.★

### New Product Evaluation Coordinator Named

Masha Wilson has been appointed as the department's Product Evaluation Coordinator within the Research Division.

Masha, who holds a Ph.D in geochemistry from Moscow State University, Russia, joined NDOT in 1998 as a chemist in the

Materials Division. Prior to that, she worked as a research scientist at the University of Nevada in Reno, the University of Southampton, United Kingdom, and the University of Quebec, Canada.★

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.

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If you have comments or need additional information regarding any of the topics discussed in this issue, please contact **Alan Hilton**, Research Division Chief, at (775) 888-7803. [ahilton@dot.state.nv.us](mailto:ahilton@dot.state.nv.us)



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