RESEARCH AND TECHNOLOGY

REVIEW

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RESEARCH BULLETIN

NDOT FY 2003 NEW RESEARCH PROJECTS SELECTED

Following the established NDOT research project selection process, the NDOT Research Management Committee approved four new research projects for the 2003 R,D&T work program. These projects were selected based on the established selection criteria as set forth in the NDOT Research Manual and in line with NDOT's strategic research plan. The four new projects are:

1) Performance, Design, and Detailing of Two-Way Column Hinges: This research is to develop reliable, comprehensive, yet practical methods for the design of bridge column two-way hinges subjected to axial load, shear, and flexure. It will be conducted by Dr. M."Saiid" Saiidi and Dr. David Sanders at the University of Nevada, Reno.

2) Impact of Construction Variability on Pavement Performance: The proposed research will evaluate the impact of construction variability of aggregate gradation, binder content, and in-place air voids on the performance of hot mixed asphalt pavements. The research will be conducted in two phases. Phase I will evaluate two aggregate sources and Phase II will evaluate additional construction-related factors. Dr. Peter E. Sebally at the University of Nevada, Reno will be the principal investigator for this research.

3) Development of a Joint Density Specification: This research will be conducted in two phases. Phase I will evaluate the current practice in the area of joint density in terms of specifications and construction techniques. Phase II will develop specifications and effective techniques to construct longitudinal joints that can meet the specifications. Dr. Peter E. Sebaaly at the University of Nevada, Reno will be the principal investigator for this research.

4) Development of Criteria to Identify High Pedestrian Crash Locations in Nevada: The objective of this research is to develop criteria to identify high pedestrian crash locations in order to allocate Federal Safety Funds for safety improvements. Dr. Shashi S. Nambisan at the University of Nevada, Las Vegas will be the principal investigator for the research.

The Research Division and the technical panel for each of these projects are working with the principal investigators to finalize the scope of work and budget. All these projects will be initiated on January 1, 2003.**?**

ASSESSING THE SUPERPAVE SYSTEM FOR NEVADA'S CONDITIONS

An in-depth evaluation of the Superpave system has been jointly undertaken by the Nevada Department of Transportation (NDOT) and the Western Regional Superpave Center (WRSC) at the

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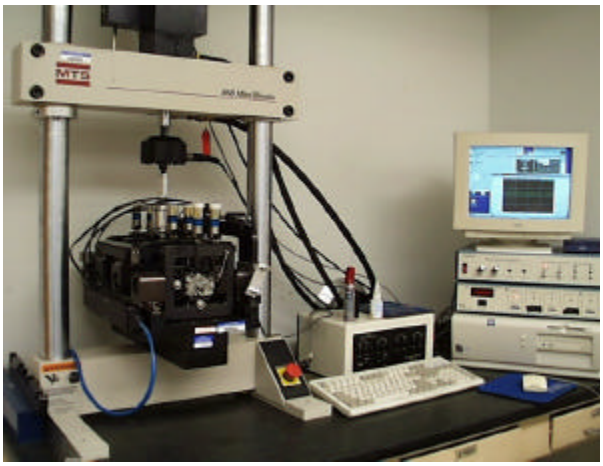

Photo 1: A hot mixed asphalt (HMA) beam being tested for its resistance to fatigue cracking.

University of Nevada Reno (UNR) to assess the performance of the Superpave system in both laboratory and field settings. The goal of the evaluation is to familiarize NDOT with the Superpave mixture design and analysis system, while at the same time gaining valuable knowledge about differences in performance among various types of HMA mixtures used within the State of Nevada.

The research activities conducted under this effort covered both laboratory and field evaluation of HMA mixtures designed with the Superpave volumetric mix design and the NDOT Hveem mix design methods. Three NDOT projects, contract 2751, 2827 and 2880, consisting of a total of four Superpave and four Hveem mixtures, were constructed within the past five years. Two of the projects included one Hveem and one Superpave section and the third project included two Hveem and two Superpave sections. The overall condition of the existing pavements were determined by visual inspection prior to construction of each section and at least bi-annually thereafter. The data collected show that in the low traffic environments Nevada (NV) mixtures performed better in terms of durability as indicated by resistance to raveling and equally or better in terms of resistance to cracking. In the high traffic environment, the Superpave mixtures exhibited more rutting than the NV mixtures and the mixtures made with polymer modified asphalt binder (AC-20P), but exhibited less rutting than the mixtures incorporating a neat PG64-22 binder regardless of mixture design method.

Based on the performance of the field sections, NDOT and WRSC researchers made the following refinements to the Superpave mixture design method:

1) Use the PG grading system with an additional requirement for a minimum percent polymer.
2) Allow the aggregate gradation to pass through the restricted zone.
3) Require a minimum Hveem stability of 37.
4) Evaluate the performance of the Superpave mixture with the Asphalt Pavement Analyzer (APA).
5) Evaluate the performance of the Superpave mixture with the AASHTO T-283 test for moisture sensitivity.

In 2001, one Superpave test section was constructed on IR-80 under contract 3064 using the above refinements. Contract 3064 is under

Continued on page 4 Superpave

Photo 2: Conditions of the Hveem section on Contract 2827 after 4 years in service.

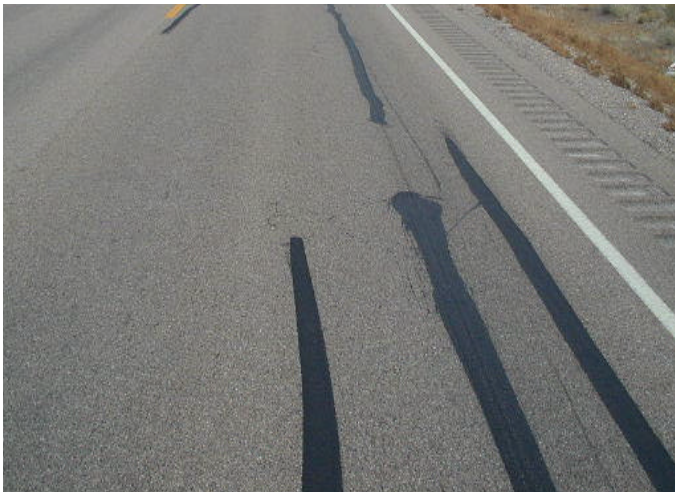

Photo 3: Conditions of the Superpave section on Contract 2827 after 4 years in service.

PEC RECAP

APPROVED
Time-Released Water Product

At its September meeting, the PEC approved an experimental field test of DriWater, a time-released water product. DriWater was specified for use on the I-580/Package A project. The project site is located on steep slopes in an area where use of traditional irrigation systems would be complicated and ineffective. DriWater is a preferred option to provide temporary watering over a traditional piped irrigation system. DriWater consists primarily of ordinary water, which is bound in the form of a solid that gradually converts to water when placed in a microbiological environment of natural soil. A quart-sized container placed next to the root mass should provide subsurface drip irrigation to a plant or seedling over a three-month period. In the past, NDOT used DriWater for temporary irrigation on a construction project in the Lake Tahoe Basin and Caltrans used it in Central California and in Bridgeport. The DriWater installations in the Lake Tahoe Basin showed mixed results for mortality rates of containerized plants. Furthermore, since these installations were not documented and monitored, no conclusive recommendations were made regarding the performance of this product.

Photo 4. One of 2 million trees planted in the Sahara desert using DriWater.

If the test on the I-580 project is successful, DriWater can be recommended for use as an alternative to our standard practices at similar geographical locations with similar soil types.**?**

APPROVED
Snow-Plowable Raised Pavement Markers

At its September 2002 meeting, based on a proposal from District III, the PEC approved the establishment of a specification and an accompanying QPL for snow-plowable raised pavement markers (RPMs).

An example of this type of product is the Iron Star pavement marker from Hallen Products. The Iron Star marker consists of an iron casting to which is attached a replaceable 3M snow-plowable marker insert for reflecting light from a single or opposite directions. The Iron Star system provides visibility from distances of 1,000 feet or more. The product's low profile base plate with contoured edges and a cast-in cross-grip is designed to reduce plow bounce and minimize vertical and horizontal movement. In addition, the pyramidal webs promote even distribution of epoxy from front to back as well as up both sides of the base casting during installation.

District III proposed that NDOT adopt the Illinois Department of Transportation's specifications and approved products list for snow-plowable raised pavement markers. This list, in addition to Iron Star markers, includes other raised pavement markers that were evaluated and approved by the Illinois Department of Transportation. Also, snow-plowable raised pavement markers included on the Illinois list are being field-tested under NTPEP auspices by the Maryland DOT.

Companies seeking to place their pavement markers on the NDOT QPL will be directed to submit a product evaluation proposal for acceptance under current NDOT specifications for snow plowable pavement markers.**?**

APPROVED
SPECIFICATION CHANGE

Based on a Materials Division request, the PEC approved a change to our current specification for the engineering fabric covered by NDOT Standard Specifications, section 731 and the establishment of an accompanying QPL.

The QPL includes two products -

Photo 6. Installation of the GeoGrid fabric to reinforce asphalt concrete overlays in pavement construction.

GlasGrid 8051 and GlasGrid 8052 from California Paving Fabrics, Inc. Both products are designed to reinforce asphalt concrete overlays in pavement construction. GlasGrid 8051, the complete road system, is used in full width reinforcement of roadways. GlasGrid 8052, the detail repair system, is specifically designed for concrete joints, major intermittent transverse cracks, construction joints on widening, and joints on trench repairs. Both systems are designed to reduce thermal and stress related cracks from reflecting through a new asphalt overlay to the surface. GlasGrid mesh is placed on the existing roadway followed by an asphalt concrete overlay. This product can be milled and recycled with any conventional process.

In the past, GlasGrid self-adhesive fabric has been specified on NDOT projects located in high profile areas that displayed large amounts of cracking. As the Materials Division indicates, one of the major benefits of this product is the self-adhesive properties feature that significantly reduces application problems during installation.

Once this revision is made and a QPL established, the manufacturers of similar products will de directed to submit their products for acceptance under current NDOT specifications.**?**

Continued from Page 2,Superpave

traffic and environmental conditions that are similar to contract 2880.

After one year of loading, the Superpave section shows no signs of rutting. Currently, NDOT and WRSC researchers are developing mix designs for potential field sections to be constructed during the 2002-2003 construction seasons. It is anticipated that one section will be constructed during fall 2002 and two additional sections will be constructed during summer 2003. By summer 2003, a total of four field projects will have been constructed, each project having one Hveem section and one Superpave section to be evaluated side-by-side. The research will evaluate the materials properties and long-term

Photo 7. Completed installation of GeoGrid fabric prior to asphalt overlay.

performance of the field sections. Based on the observed performance of the field sections, NDOT and WRSC researchers will make recommendations concerning the implementation of the Superpave mix design procedure under Nevada's conditions. For more information on this project, please contact Dr. Peter Sebaaly at (775) 784-6565 or Dean Weitzel at (775) 888-7520.**?**

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*

Photo 5. Iron Star snow plowable pavement marker from Hallen Products.

NDOT LIBRARY RECENT ACQUISITIONS

(Received July 1 through September 30, 2002)

HYDRAULICS/ENVIRONMENT

Improved Mechanisms for Stakeholder Environmental Education (FHWA-AZ-01-523), Arizona DOT; **7487**

Identification and Stabilization Methods for Problematic Soils (FHWA/LA.02/357), Louisiana DOT; **7521**

Inputs and Maintenance for Revegetation with Native Herbaceous Species (FHWA/CA/TL-2001/06), Caltrans; **CD 7852**

Development of an Invasive Species Information (FHWA/CA/TL-2001/33)**,** Caltrans; **7875**

Controlling the Spread of Xylella Fastidiosa, the Causal Agent of Oleander Leaf Scorch, by Disrupting Vector Acquisition and Transmission (FHWA/CA/TO-2002/17) California DOT; **8190**

Corrosion Effects of Magnesium Chloride and Sodium Chloride on Automobile Components (CDOT-DTD-R-2002-4), Colorado DOT; **8587**

Evaluation of Slope Stabilization Methods (US 40 Berthoud Pass) (CDOT-DTD-R2002-10) Colorado DOT; **8630**

MATERIALS/PAVEMENTS

Pavement Evaluation Using Integrated Data from High-Speed Sensors (Final Report)(CD) U.C. Beckley; **980**

3-Year Laboratory Evaluation on Rapid Set Patching Concrete (02 NTPEP 225), AASHTO; **7264**

Research Pays Off 1983-2001 (CD-ROM), Transportation Research Board; **7442**

Bituminous Materials Research Series III, Projects 9-10, 9-14, and 9-19 (NCHRP); **CD-7486**

Field Evaluation of a Portable Gyratory Compactor (FHWA-OR-RD-02-18), Oregon DOT; **7493**

Field Verification Process for Open-Graded HMAC Mixes (FHWA-OR-DF-03-01), Oregon DOT; **7511**

Cost of Sanding (CDOT-DTD-R-2002-5), Colorado DOT; **7520**

LTPP Data Analysis: Effectiveness of Pavement Maintenance and Rehabilitation Options (Final Report), NCHRP**;**

7522

Service Life Prediction Based on Sorptivity for Highway Concrete Exposed to Sulfate Attack and Freeze-thaw Conditions (FHWA-RD-01-162), FHWA; **7607**

LTPP Data Analysis: Variations in Pavement Design Inputs - Final Report (30-50(05), NCHRP; **7608**

Rapid Drying Soils with Microwave Ovens (FHWA/LA.02/359), Louisiana DOT**; 7968**

Evaluation of Modified Asphalt Using Chlorinated and Maleated Waste Polymers (FHWA/LA-02/345), Louisiana DOT;**7967**

Evaluation of Silica Fume High Density Thin Bonded Overlays - Final Report (FHWA/OK 02(2), Oklahoma DOT; **8244**

PLANNING/PROGRAM DEVELOPMENT

Protecting Public Surface Transportation Against Terrorism and Serious Crime: An Executive Overview (FHWA/CA/OR-2001-29), CALTRANS; **7490**

I-15 Corridor Reconstruction Project, Design/Build Evaluation 2001 Annual Report (UT-02.11) Utah DOT; **7491**

Certification of Size and Weight Enforcement Plan, NDOT 1999-2000; **7509**

The Congestion Mitigation and Air Quality Improvement Program (SR264), TRB; **7572**

Technologies to Improve Consideration of Environmental Concerns in Transportation Decisions (NCHRP Project 2522), NCHRP, CD; **7830**

An Integrated Approach to Managing Local Container Traffic Growth in the Long Beach-Los Angeles Port Complex Phase II (FHWA/CA/OR-2002/10), Caltrans; **7872**

3D Virtual and Physical Simulation of Automated Container Terminal and Analysis of Impact on in Land Transporta (FHWA/CA/OR-2002/15), Caltrans; **7873**

Risk Modeling for Commercial Goods Transport (FHWA/CA/OR-2002/11), Caltrans; **7874**

Assessment of Hybrid Configuration and Control Strategies in Planning Future Metropolitan/Urban Transit Systems (FHWA/CA/OR-2002/12), Caltrans; **7876**

Alternative Access and Locations for Air Cargo (FHWA/CA/OR-2002/13), Caltrans; **7877**

Increasing Transit Ridership: Lessons from the Most Successful Transit Systems in the 1990s (FHWA/CA/TO-2002/22), Caltrans; **7880**

Lessons Learned: A Conference on Transit Referenda and Why They Succeed or Fail (FHWA/CA/IR-01/03), Caltrans; **7881**

Travel Behavior and Needs of the Poor: A study of Welfare Recipients in Fresno Co., Ca (FHWA/CA/OR-2001-23), Caltrans; **7882**

The California General Plan Process and Sustainable Transportation Planning (FHWA/CA/OR-2001-30); **7883**

Why Campaigns for Local Transportation Funding Initiatives Succeed or Fail: An Analysis of Four Communities an National Data (FHWA/CA/OR-1999/19), Caltrans; **7884**

Envisioning Neighborhoods with Transit-Oriented Development Potential (FHWA/CA/OR-2001-25), Caltrans; **7885**

STRUCTURES

The Behavior of Prestressed High Performance Concrete Bridge Girders for US Highway 401 over the Neuse River i Raleigh, NC (FHWA/NC/2002-003), North Carolina DOT; **8623**

TRAFFIC/SAFETY

Development and Evaluation of the Lane Merge Traffic Control System at Construction Work Zones-Final Report (RC-1409), Michigan DOT; **6162**

Pedestrian Crosswalk Safety: Evaluating In-Pavement, Flashing Warning Lights (FHWA-NJ-2002-15), New Jersey DOT; **7478**

Dancing Diamonds in Highway Work Zones: An Evaluation of Arrow-Panel Caution Displays (UT-02.13), Utah DC **7482**

Traffic Volume Monitoring Related Research II (FHWA-PA-2002-019-04(108), Pennsylvania DOT; **7550**

Rating System for Rollover Resistance, An Assessment (Special Report 265), TRB; **7606**

Assessing Public Inconvenience in Highway Work Zones (FHWA-OR-RD-02-20), Oregon DOT; **7611**

Development of a Low-Cost Automated Crash Notification System (FHWA-NJ-2001-027), New Jersey DOT; **7624**

Compliance Crash Testing of the Type 60K Concrete Barrier Used in Semi-Permanent Installations (FHWA/CA/TL-2001/08), Caltrans; CD **7851**

Development of Site-Specific ESAL (CDOT-DTD-R-2002-09), Colorado DOT; **8166**

Fuzzy Variable Speed Limit Device Modification and Testing Project, Phase II Final Report (AZ-466(2)), Arizona DOT; **8638**

REFERENCE BOOKS

2001 Data Annual Vehicle Miles of Travel, NDOT: **7492**

CFR's New Edition **2002**

Roadside Design Guide 2002 AASHTO; **227**

Policies and Procedures Manual, NDOT; **6927**

Transportation Research Record, Papers Presented at the 2000 Annual Meeting of the Transportation Research Board and published in Volumes 1696 - 1740 (CD)**; 983**

Transportation Research Record, Includes 1996-2000 Index of Transportation Research Board Publications (Volume 1741-1780); **CD-7431**