



Research Newsletter

Minnesota Department of Transportation
 Research Services Section
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Office of Investment
 Management

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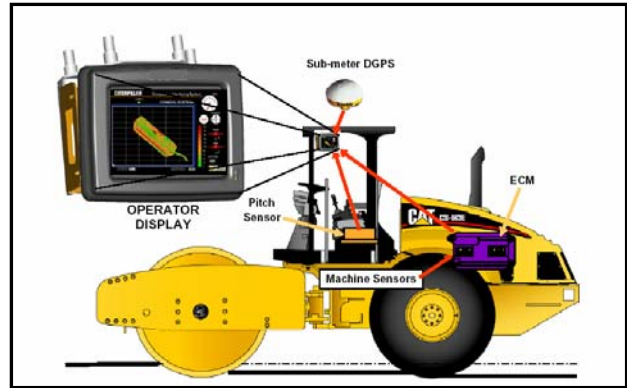
Issue 3

Ninth Annual Minnesota Pavement Conference Update

During the Annual Pavement Conference which took place on Feb. 17, 2005, at the Continuing Education and Conference Center, St. Paul Campus University of Minnesota, Iowa State University gave a presentation on "Field Evaluation of Compaction Monitoring Technology." The research was conducted by David White, Tom Cackler, Ed Jaselskis and Vernon Schaefer from Iowa State University with the assistance of graduate students, Isaac Drew, Lifeng Li and Mark Thompson.

The presentation of the Phase I research report describes a preliminary evaluation of a new compaction monitoring system developed by Caterpillar, Inc. which proved to be a huge success. The primary research objectives for this project were:

- Evaluate the compaction monitoring technology on various project sites for a wide range of compaction materials.
- Identify any modifications needed to be made on the technological and communication systems.
- Develop Quality Control/Quality Assurance guidelines for the technology.
- Identify benefits for contractors and owners in using the technology.



CAT Compaction monitoring system components

Continued on page 3

Calendar of Events

APRIL

17-21	National Association of County Engineers 2005 Annual Conference, Bismarck, North Dakota. Contact NACE, (202) 393-5041, nace@naco.org
18	Fourth Oberstar Forum on Transportation Technology, Minneapolis. Contact Teresa Washington, (612) 624-3745, twashing@cce.umn.edu
20-21	Spring Maintenance Training Expo, St. Cloud. Contact Teresa Washington, (612) 624-3745, twashing@cce.umn.edu
26-27	16 th Annual CTS Transportation Research Conference, RiverCenter, St. Paul Contact Katie Kjeseth, (612) 624-3708, kkjeseth@cce.umn.edu

MAY

2-4	ITS America's 15th Annual Meeting and Exposition in Phoenix, Arizona. For more information visit http://www.itsa.org/annualmeeting.html
11-13	Minnesota Public Works Association Spring 2005 Conference, Nisswa. Contact Heather Dorr, (612) 625-5267, hdoor@cce.umn.edu
23-24	Biennial meeting of the TRB State DOT Representatives in Washington, D.C. For more information contact Rosa Allen at rallen@nas.edu

JUNE

5-8	Special Libraries Association 2005 Annual Conference in Toronto, Canada. For more information visit http://www.sla.org/content/Events/conference/ac2005/index.cfm
23-24	Joint LRRB and Research Implementation Committee (RIC) meeting in Onamia, Minnesota. Contact Susan Kahle, (651) 296-1542, susan.kahle@dot.state.mn.us

The Minnesota Road Research Facility Geographical Information System Project

Extensive data collection at the Minnesota Road Research Facility (MnROAD – <http://www.mnroad.dot.state.mn.us/research>) over the past 10 years has resulted in a large volume of geospatially related data. Research Scientist Ruth Roberson and Research Engineer Bruce Chadbourn are currently leading the effort in the Office of Materials, Road Research Section to incorporate the use of a geographic information system (GIS) to summarize, analyze, and display MnROAD data. The goal of the project is to make the MnROAD data more accessible to Mn/DOT and other researchers via a web based GIS. A GIS is capable of storing large volumes of geospatial data for the purpose of improved data analysis and decision-making. The development of a MnROAD GIS will allow researchers to analyze data and present findings that may not otherwise be evident.



FSA Wright County aerial photo of MnROAD

There are three phases to the MnROAD GIS project. Phase I of the project is focused on creating a MnROAD GIS specifically for researchers in the Road Research Section for the purpose of summarizing, analyzing, and displaying MnROAD data. This primarily consists of building a geodatabase from the existing MnROAD Oracle database. With the help of Mn/DOT's GIS Support Unit, to date a MnROAD basemap has been generated from CAD files, aerial photos and GPS data, and methods for georeferencing scanned images of distress maps have been developed. Over the next six months data such as sensor location, distress maps, water table elevation, soil moisture, pavement strain measurements, and deflection data will be incorporated into the geodatabase.

Phase II of the project includes collaboration, with a Research Engineer from the University of Washington via the State Pavement Technology Consortium (SPTC - <http://pavements.ce.washington.edu/sptc>), to build a web-based interface for the MnROAD GIS. This will provide access to other agencies and researchers around the country. It is anticipated that Phase II will begin during the summer of 2005.

Continued on page 3

Profile of the Month



Bernard Izevbekhai

Mr. Izevbekhai is the Research Operations Engineer in Concrete Research with Mn/DOT's Minnesota Road Research Section.

Mr. Izevbekhai initiates and coordinates Mn/DOT's research in concrete pavements, and concrete related elements in bridges and approach panels towards improved pavement performance and better construction practice. He also coordinates data collection and analysis from targeted test sections at MnROAD towards mechanistic empirical design and analysis of concrete pavements.

He completed his undergraduate and Master of Engineering degree specializing in Civil/ Structural from the University of Benin, in Nigeria. Mr. Izevbekhai also received a Master of Science degree in Infrastructure Systems Engineering from the University of Minnesota. He is a member of ASCE, IABSE, MGS, ISCP, MC².

His current project at Mn/ROAD is on the "Effect of Texture on Measurement of Ride Quality of Concrete Pavements." This is a study of the filter algorithms and transfer functions from the frequency to spatial domain, for incentives and dis-incentives in concrete paving projects by interpretation of dynamics due to texture. In his free time he enjoys playing table tennis (ping pong) and soccer.

Bernard can be reached at Bernard.Izevbekhai@dot.state.mn.us or (651) 779-5608.

Continued from page 2

Finally, Phase III is the implementation of broad access to MnROAD Research Partners for the purpose of creating a seamless connection between data collection on specific projects and Research Partners. Phase III is expected to be implemented during the 2006 construction season at MnROAD.

A key component of the MnROAD GIS project has been the acquisition of a survey grade GPS system. The system uses correction data from GPS base stations at MnROAD and several other locations, to achieve 1 centimeter horizontal accuracy and 1.5 centimeter vertical accuracy. The GPS unit will be used to collect distress data that was originally collected manually using hand drawn maps. The conversion to a more automated system will reduce errors, make data collection more efficient and allow researchers to readily access the data for timely and detailed analysis.



Trimble Geographic Positioning System (GPS)

For more information on the use of a GIS contact Ruth Roberson at Ruth.Roberson@dot.state.mn.us.

We're on the Web!
<http://www.research.dot.state.mn.us/>

Continued from page 1

The CAT compaction monitoring system consists of an instrumented roller with sensors to monitor machine power output in response to changes in soil-machine interaction and is fitted with a global positioning system to monitor roller location in real time. Three field tests were conducted at Caterpillar Peoria Proving Ground, Caterpillar Edwards Facility and Wells Fargo Headquarters in Des Moines, Iowa.

The results of this study show that it is possible to evaluate soil compaction with relatively good accuracy using machine energy as an indicator, with the advantage of 100% coverage with results in real time.

The work plan for Phase II is proposed to include:

- (1) a larger number of test sites in Iowa and surrounding states for evaluation
- (2) side-by-side comparisons of the new technology with existing compaction equipment and methods
- (3) evaluation of computer algorithms used to develop the compaction monitoring output
- (4) development of detailed QC/QA specifications based on a statistical framework considering data variability and reliability.

Phase I report of the Field Evaluation of Compaction Monitoring Technology is available at

<http://www.ctre.iastate.edu/reports/tr495.pdf>

In addition to the research conducted by Iowa State University, in September of 2004 engineers conducted a Continuous Compaction Control (CCC) demonstration at MnRoad. This report is now available at

<http://www.lrrb.org/PDF/200507.pdf>

For more information contact David White, Assistant Professor at Iowa State University djwhite@iastate.edu or (515) 294-1463.

Mn/DOT Pooled Fund Studies

The Transportation Pooled Fund (TPF) Program allows State departments of transportation (DOTs) and the Federal Highway Administration (FHWA) to create synergy—by leveraging resources, avoiding duplication of effort, and joining forces on planning and research projects of mutual interest. The TPF Program has existed for more than 20 years. Historically, keeping up with TPF projects involving several partners and disseminating information to the partners and other parties has been complicated and time consuming.

A State DOT or FHWA must sponsor each TPF project. For a study to qualify for the TPF Program, more than one State transportation agency, Federal agency, other agency (such as a municipality or metropolitan planning organization), university, or private company must find the subject important enough to volunteer funds or other resources to conduct the research, planning, or technology transfer activity.

At the end of fiscal year (FY) 2003, there were 252 pooled fund projects listed on the web site and valued at \$130,013,179. Of those projects, 133 were State led and 119 were FHWA led. All 252 projects included at least one State DOT. In addition, all 50 States, along with the District of Columbia and Puerto Rico, were involved in at least one project. Thirty-six different states were the lead partner on one or more projects. TPF projects ranged widely in scope. In dollar terms, projects ranged from \$100,000 to \$3,500,000.

Following are the Current Active Mn/DOT Pooled Fund Studies – Calendar Year 2005

STUDY NO.	STUDY TITLE
SPR-TPF5(044)	National Cooperative Highway Research Program (NCHRP)
SPROO4(300)*	Investigation of Deterioration of Stainless Steel Dowel Tubes Under Repeated Loading
SPR-2(207)	Traffic Management Center (TMC) Study
SPR-2(208)	Subgrade Failure Criteria
SPR-3(017)	Midwest State Crash Testing
SPR-3(020)	Enterprise
SPR-3(042)	Aurora
SPR-3(049)	Urban Mobility Study
SPR-3(073)	Micro-Surface Mix Design Procedure
SPR-3(074)	State Consortium for Pavement Technology (Pavement Research and Technology)
SPR-3(095)	Cooperative Vehicle-Highway Automation System (CVHAS) (Phoenix Project)
TPF-5(001)	Soil Mix Methods for Highway Application
TPF-5(021)	North Central Superpave Center (NCSC)
TPF-5(036)	Transportation Asset Management Research Program
TPF-5(037)	Southeast Superpave Center
TPF-5(042)	Investigation of the Long-Term Effects of Magnesium Chloride
TPF-5(045)	Performance Guidelines for the Selection of Hot-Pour Crack Sealants
TPF-5(051)	Construction of Crack-Free Concrete Bridge Decks
TPF-5(054)	Development of Maintenance Support System
TPF-5(O55)	Rapid Bridge Replacement Techniques

Continued on page 5

Continued from page 4

STUDY NO.	STUDY TITLE
TPF-5(066)	Material & Construction Optimization
TPF-5(068)	Long Term Maintenance of Load & Resistance Factor Design Specs
TPF-5(069)	TRB Core Program Services for FY05
TPF-5(073)*	Portable Non-Intrusive Technology for Traffic Detection (PNIT)
TPF-5(078)	Upper Midwest Corridor Study
TPF-5(080)*	Investigation of Low Temperature Cracking in Asphalt Pavements
TPF-5(086)*	Reducing Crashes at Rural Intersections
TPF-5(090)	Pavement Tools Consortium
TPF-5(092)	Test and Evaluation of Materials, Equipment & Methods for Winter Highway Maintenance
TPF-5(093)*	North/West Passage (Phase I)
TPF-5(099)	Evaluation of Low Cost Safety
TPF-5(105)	Transportation Library Connectivity
TPF-5(107)	Refinement and Field Validation of Mix Design Criteria for 4.75 mm Superpave Mixes
880	Midwest States Pooled Fund Pavement Preservation Partnership (<i>in solicitation phase</i>)

* denotes Minnesota as the lead state

More information about the Transportation Pooled Fund (TPF) Program can be found at: www.pooledfund.org or contact Jim Klessig at James.Klessig@dot.state.mn.us

Mn/DOT Research Projects for Fiscal Year 2006

Following are the projects that were selected for Fiscal Year 2006:

Title	Principal Investigator	Department	Duration in Months	TL Research Project
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Transit, Bikeways and Pedestrians

Commuter Bicyclist Behavior and Facility Disruption	Dr. Francis Harvey	U of M Geography	12	Darryl Anderson, MnDOT Office of Transit
Improving Capacity Planning for Demand-Responsive Para transit Services	Diwakar Gupta	U of M Mechanical Engineering	12	Michelle Gutzmann, MnDOT Office of Transit

Transportation Data Analysis

Development of Portable Eight-Channel WIM Analysis System Based on Analog WIM Signals	Taek M. Kwon	U of M Electrical & Comp Eng	24	George Cepress
Feasibility Study of Portable Weigh-in-Motion (WIM) Systems for Highway Speeds	Kenneth Miller	St. Cloud State Univ - Comp Science	8	George Cepress

Title	Principal Investigator	Department	Duration in Months	TL Research Project
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Bridge

Evaluation and Analysis of Mn/DOT Steel Bridges Inventory for Prioritizing Bridge Maintenance Needs	Arturo E. Schultz	U of M Civil Engineering	12	Jim Pierce
Monitoring and Analysis of a Full Depth Precast Concrete Bridge Deck System	Catherine French	U of M Civil Engineering	24	Keith Molnau

Construction and Contracting

Best Value Based on Performance	Magdy Abdelrahman	NDSU CE	20	Joe Gladke and Mike Leegard
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Environmental

Canada Thistle Seed Movement	Roger Becker	U of M Agronomy and Plant Genetics	24	Bob Jacobson
Wildlife Value of Reed Canary Grass Infested Wetlands in MN	Brock McMillan	MN State Univ Mankato Biological Science	24	Bob Jacobson
Design Tool for Controlling Runoff and Sediment from Highway Construction	Bruce N. Wilson	U of M Biosystems and Agricultural Engineering	24	Leo Holm

Freight, Railroads and Waterways

Development of Measurement Sources for Freight Performance Indicators	Amiy Varma	NDSU CE	15	Robert Gale
Active Advance Warnings at Highway-Rail Intersections	Thomas J. Smith	U of M Kinesiology	12	Susan Aylesworth

Title	Principal Investigator	Department	Duration in Months	TL Research Project
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Investment Management

Volume Warrants for Right Turn Lanes	Amiy Varma	NDSU CE	12	Brian Gage
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Maintenance

Snow and Ice Operations Cost Analysis	Tom Maze	Iowa State CTRE	12	Steven Haider
Development of a Trash Harvester for MNDot Phase 2	Jonathan Chaplin	U of M Biosystems and Agricultural Engineering	12	Bob Wryk

Pavement and Materials

MnROAD Lessons Learned - Synthesis	Lev Khazanovich	U of M Civil Engineering	12	Dave Johnson
Investigation of Stripping in MN Class7 (RAP) and Full Depth Reclamation Base Material	Magdy Abdelrahman	NDSU CE	18	Shongtao Dai or Local Eng.

Traffic, Security and Operations

Employment of the Traffic Management Laboratory for the Evaluation and Improvement of Stratified Metering Algorithm: Phase IV	Panos Michalopoulos	U of M Civil Engineering	12	Todd Kramasz
Low Cost Innovative Approaches to Improve Safety at Un-Signalized Intersections on 4-Lane Highways	Kathleen A. Harder	U of M College of Architecture and Landscape Architecture	12	Loren Hill
Evaluation of Minnesota's NightCAP	Janet Creaser	U of M Mechanical Engineering	12	Loren Hill

LRRB Selected Projects for Calendar Year 2005

Title	Principal Investigator	Department	Duration in Months	TL Research Project
Crack Sealing and Filling Performance	Bill Zerfas	Mn/DOT Materials and Road Research	24	Tom Struve City of Eagan
Validation of DCP and LWD Moisture Specifications for Granular Material	John Siekmeier Ruth Roberson	Mn/DOT Materials and Road Research	12	Larry Berkand
Performance Monitoring of Olmsted CR 117 and 104 and Aggregate Base Material Update	Marc Loken	Mn/DOT Materials and Road Research	60	Mike Sheehan Lou Tasa
Local Road Materials Properties and Calibration of MnPAVE	Bruce Chadbourn	Mn/DOT Materials and Road Research	18	Richard Larson
Appropriate Use of RAP	Ed Johnson	Mn/DOT Materials and Road Research	24	John Brunkhorst
Investigation of Winter Pavement Testing	Ed Johnson	Mn/DOT Materials and Road Research	16	Gary Bruggeman
Evaluating Roadway Subsurface Drainage Practices	John Nieber	University of Minnesota (U of M), Biosystems	24	Steve Schneider Ruth Roberson
The Road to a Thoughtful Street Tree Master Plan	Gary Johnson	U of M, Forestry	16	Tom Pagel
Design Tool for Controlling Runoff and Sediment from Highway Construction	Bruce N. Wilson	U of M Biosystems and Agricultural Engineering	24	Leo Holm
Volume Warrants for Right Turn Lanes	Amiy Varma	NDSU CE	12	Brian Gage
Investigation of Stripping in MN Class7 (RAP) and Full Depth Reclamation Base Material	Magdy Abdelrahman	NDSU CE	18	Shongtao Dai
Development of Improved Proof Rolling Methods For Roadway Embankment Construction	Andrew Drescher	U of M Civil Engineering	24	Dave Van Deusen Richard Heilman
Assessment of Storm Water Management Practices on the Water Quality of Runoff	John Gulliver	U of M Civil Engineering	24	John Haukaas
Best Use of Cone Penetration Testing	Joe Labuz	U of M Civil Engineering	12	Rich Lamb Dave Shanahan
Design Procedures for Bituminous Stabilized Road Surfaces for Low Volume Roads	Jim Wilde	MN State @ Mankato	20	Al Forsberg

**For more information on any of the Mn/DOT and LRRB selected projects contact
Gary Orlich at Gary.Orlich@dot.state.mn.us**