



IMPACTS OF HEAVY FARM EQUIPMENT ON RURAL ROADS

Preliminary results of a TERRA pooled-fund study

Over the past few decades, farms have consolidated and farm size has increased significantly. The farm equipment industry has responded by producing larger and heavier equipment. For example, it is not unusual to see liquid manure application equipment that hauls 9,000 gallons or more. Innovations such as steerable axles, flotation tires (spreading the load over a much larger area), and new tire designs have been implemented on the equipment in recent years. The length, width, and axle loads of the large equipment could potentially accelerate damage on roads. However, there is insufficient data to show the

effects of the equipment on pavement response and performance.

Pooled-Fund Study

A TERRA-initiated research study through the FHWA Transportation Pooled Fund, Effects of Implements of Husbandry "Farm Equipment" on Pavement Performance, TPF-5(148), was begun in 2008 to study pavement response under selected agricultural equipment and a typical 5-axle semitrailer truck. Two sections of a specially constructed "farm loop" test track at MnROAD were instrumented with different types of electronic sensors to measure pavement responses, *Continued on page 3*

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Please pass this on to other interested parties in your office.





FROM THE DESK OF...



The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) contains scoping and technical requirements for accessibility to buildings and facilities by individuals with disabilities under the Americans with Disabilities Act (ADA) of 1990. These scoping and technical requirements are to be applied during the design, construction, and alteration of buildings and facilities covered by titles II and III of the ADA to the extent required by regulations issued by Federal agencies, including the Department of Justice and the Department of Transportation, under the ADA.

On December 21, 1992, the United States Access Board proposed guidelines for State and local government facilities that included a section on public rights-of-way. When the final rule for State and local government facilities was published on January 13, 1998, the Access Board reserved requirements for public rights-of-way. On June 17, 2002, the Access Board released draft Public **Rights-of-way Accessibility Guidelines** (PROWAG) for public comment based on the Public Rights-of-Way Access Advisory Committee's report. On November 23, 2005, the Access Board placed a revised draft PROWAG in the rulemaking docket to facilitate developing an impact analysis. While the ADA requires public rights-of-way

to comply with accessibility standards, specific guidelines for public rightsof-way are not finalized almost 20 years after ADA went into effect.

Since PROWAG is not finalized, highway agencies often find it difficult to provide accessible routes that comply with ADAAG and meet the needs of all users. The United States Department of Justice is responsible for enforcing ADA; however, the Federal Highway Administration (FHWA) has a major role and responsibility to oversee compliance on pedestrian access required by the ADA and Section 504 of the Rehabilitation Act of 1973 (Section 504). Furthermore, the Illinois Environmental Barriers Act may also require more stringent public rights-of-way accessibility than ADA through the Illinois Accessibility Code (IAC). The Illinois Attorney General is responsible for enforcing IAC compliance.

Due to recent interpretations by regulatory agencies and courts, local public agencies should consider upgrading curb ramps, detectable warnings, and crosswalk to comply with current ADA requirements whenever Hot-Mix Asphalt resurfacing is

occurring. The Illinois Department of Transportation (IL DOT) established ADA requirements for local public agencies using Federal, State, or Motor Fuel Tax funds in Section 41-6 of the Bureau of Local Roads & Streets Manual (www.dot.il.gov/blr/ manuals/blrmanual.html). This section covers bus stops, parking (onstreet and off-street), accessible routes, sidewalks, ramps, curb ramps, and pedestrian over/underpasses. Over the next several months, the department will review Section 41-6 to incorporate PROWAG into existing policy and to clarify the ADA requirements for resurfacing projects. The department will coordinate these changes with FHWA and the Office of the Illinois Attorney General; therefore, local public agencies may want to officially adopt this section as their guideline for complying with ADA on public rights-of-way.

For more information and resources on PROWAG, please visit the Access Board's web site at www.access-board.gov.

Kevin Burke III, P.E., T2 Program Manage



Continued from page 1

such as stress and strain. One section, with 5.5 inches of hot-mix asphalt (HMA) and a 9-inch gravel base, represents a typical 10-ton road. The other, with 3.5 inches of HMA and 8 inches of gravel, is a typical 7-ton road. The main objectives of this pooled-fund project:

- Determine the pavement response under various types of agricultural equipment (including the impacts of different tires and additional axles) using instrumented pavements at MnROAD.
- Compare the pavement response under farm equipment to the pavement response under a typical 5axle semi tractor-trailer and determine the damage caused by farm equipment, if any.

This pooled-fund project includes contributions from Iowa DOT, Illinois DOT, Wisconsin DOT, the Minnesota Local Road Research Board (LRRB), the Professional Nutrient Applicators Association of Wisconsin (PNAAW), and Mn/DOT. Many industry partners, including equipment and tire manufacturers and farm applicators, are participating in the project and contributing equipment and labor.

The pooled-fund project will conclude in fall 2011.

Preliminary Results

Researchers tested farm equipment and a 5-axle semi on two sections of the MnROAD farm loop. Earlier test results in spring and fall 2008 demonstrated that axle load has a pronounced effect on pavement stress—the stress increased with axle load. For flotation tires, the pavement-tire contact area increased with load. The data also indicated that the bottom of a pavement could undergo fatigue from tension to compression depending on wheel location. In spring 2009, researchers observed extensive rutting on the 7-ton section, which is paved with a thinner layer of asphalt. This failure illustrates the importance of spring load restrictions for this type of pavement. During fall 2009 testing, more damage was detected on another part of the 7-ton section. These preliminary findings suggest that this type of pavement is not strong enough to support repeated applications of heavy loads.

Next Steps

Three more cycles of testing are planned, in spring and fall of 2010 and spring 2011. The key objective of the final rounds of testing is to collect more data. The results and findings will be updated as more data are collected and analyzed.

Background

In 2001, responding to industry concerns, the Minnesota Department of Transportation (Mn/DOT) conducted a scoping study on the impact of agricultural equipment on Minnesota's low-volume roads. The study reviewed several county roads where damage was suspected from farm equipment. However, the study found that other heavy vehicles, such as trucks hauling gravel or rock from quarries, also might have contributed to the damage. One of the recommendations from the study was to conduct a field investigation at MnROAD to specifically address pavement damage due to agricultural equipment.

A 2005 synthesis study by Mn/DOT, building on research conducted by the South Dakota and Iowa DOTs, found that there is a significant body of quantitative information validating the detrimental effects of heavy agricultural equipment on local roads. Generally, implements of husbandry can be characterized as being heavy, having large transverse tire spacing, and being slow-moving, the study found. All three of these characteristics have considerable adverse effects on the performance of roadway pavements.

Degradation of pavements has been specifically linked by numerous researchers to three common attributes of farm equipment:

- exceeding the 20,000-pound singleaxle weight limit
- having wide transverse tire spacing(s), which places heavy loads on pavement edges that can become critically stressed (this phenomenon can decrease the design life of rigid pavements by up to 20 times) moving slowly, which increases the load duration, exacerbating rutting (permanent deformations) in flexible pavements

For Further Reading

- Effects of Implements of Husbandry "Farm Equipment" on Pavement Performance, TPF-5(148) pooled-fund project
- TERRA E-News reports about the farm implements project
- Response of Iowa Pavements to a Tracked Agricultural Vehicle (CTRE report, December 2000)
- Impact of Agricultural Equipment on Minnesota's Low Volume Roads (Mn/DOT scoping study, Jan. 2001)
- Impacts of Overweight Implements of Husbandry on Minnesota Roads and Bridges (Mn/DOT report, 2005)
- "Vehicle Weight Exemption: Boon or Bust" (Minnesota Counties, September 2004)
- Effects of Off-Road Equipment on Flexible Pavements (SDLTAP Special Bulletin No. 44, 2002)

NEW ITEMS ADDED TO ILLINOIS T2 LIBRARY

The following items have recently been added to the Technology Transfer Center's Library.

V194 New Run-Off-Road/Rumble Strip, Roadway Safety Foundation, South Carolina DOT, 2010

The Roadway Safety Foundation in conjunction with the South Carolina DOT has launched a safety public education campaign called Recognize, React, Recover: Using Rumblestrips to Prevent Run-off-the-Road Crashes. A new DVD details the benefits of rumblestrips in preventing run-off-the-road crashes.

V193 Accessible Sidewalks - Design Issues for Pedestrians with Disabilities, U.S. Access Board, 2010

Accessible Sidewalks is a four-part video developed by the Access Board to illustrate access issues and considerations in the design of sidewalks. The series covers access for pedestrians with mobility impairments, including those who use wheelchairs, and pedestrians who are blind or have low vision.

V192 Best Defense is a Good Road, Cornell Local Roads Program, 2010

This video shows how lawsuits can be minimized through good management, proper record keeping, and routine inspection by local roads officials. A court scene presents a road superintendent who is accused of being negligent in repairing a damaged road sign but is found innocent because of proper management and documentation.

P007 Maintenance of Signs and Sign Supports for Local Roads & Streets, Federal Highway Administration, January 1, 2010 UPDATED

(Publication FHWA-RT-00-00) A guide for street and maintenance personnel; covers repairs and replacement of sign panels and supports, and the materials and equipment to do this.

L041 Sign Retroreflectivity Guidebook, U.S. Department of Transportation, Federal Highway Administration, September 1, 2009

(FHWA-CFL/TD 09-005) This document was developed to assist small-sized agencies without traffic engineering staff in meeting the new Federal requirements for maintaining traffic sign retroreflectivity on roads open to public travel. By considering the needs and capabilities of small agencies, this document provides the necessary information needed to be in compliance with the new traffic sign retroreflectivity requirements.

C007 Local Roads Safety Resource, U.S. Department of Transportation, Federal Highway Administration – Office of Safety, 2010

FHWA has created a new CD that provides quick and easy access to the latest information on local roads safety. Whether you are a local road safety advocate, a practitioner, an elected official, or a community leader, you need information and tools to plan and implement roadway safety improvements. Organized by topic area in one place, the Local Roads Safety Resource CD provides guidance, tools, and other resources from government agencies and national associations on local roadway safety. The CD's easy-to-use format and portability make it a vital resource for your agency's local roads safety resource library.

Copies of the new additions to the library can be obtained by using the order form on the next page. If you have any questions regarding our video/publication/CD library, please contact Tara Driskell at 217/785-2350.

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2009 IDOT Engineer of the Year **ERIC S. THERKILDSEN Region 3 District 4**

This year Eric took on the responsibilities of two vacant positions in his Bureau – Land Acquisition Engineer and Condemnation Engineer. This past summer, the District 4 Programming Engineer passed away. Eric took on these duties as well. The ARRA and mini-State Capital Program brought an additional \$140 million of projects to District 4, which had to be on the April, May, and June lettings. Eric must keep the State Capital Program projects in line to go to construction in FY2012.

For taking on all of these additional duties and responsibilities, Eric deserves to be recognized as the Statewide Engineer of the Year for 2009.



ENGINEER OF THE YEAR NOMINEES

John S. Huang, Region 1/District 1 Chris Aude, Region 2/District 2 Kyle Videgar, Region 2/District 3 Michael D. Carnahan, Region 3/District 5 Dan Mlacnik, Region 4/District 6 David R. Buzzard, Region 4/District 7 Jeffrey W. Church, Region 5/District 8 Doug Keirn, Region 5/District 9 Greg S. Lupton, Local Roads & Streets, Central Office

2009 IDOT Technician of the Year COREY WELLS Design and Environment

Corey has played an active role in testing and evaluating equipment and procedures for Continuously Operating Reference Stations (CORS) to determine how IDOT could access those networks. He spent months in the field traveling to different areas where network densities varied to test procedures and evaluate data. Once procedures are finalized and implemented statewide, the Department should save around \$400,000 per year in surveying hours.

Corey's dedication and expert knowledge make him a valuable asset to Aerial Surveys and deserving of the Engineering Technician of the Year for 2009.





TECHNICIAN OF THE YEAR NOMINEES

Brian M. Carlson, Region 1/District 1 Laura J. Connolly, Region 2/District 2 Steve Faletti, Region 2/District 3 Josh Knowles, Region 3/District 4 Greg A. Eaglin, Region 3/District 5 Elmer (Junior) W. Pearcy, Region 4/District 6 Dave Manley, Region 4/District 7 RuAnna M. Stumpf, Region 5/District 8 Lannie Lance Gribble, Region 5/District 9

IACE ENGINEERS OF THE YEAR

Each year the Illinois Association of County Engineers recognizes certain members who excel at being active in the Illinois Association of County Engineers, active in their community, and exemplary in their work for their county government. The selection for the award is based on a vote by the recipient's peers who are the IACE members in each respective zone. This year's awards were presented at the 96th Annual T.H.E. Conference which was recently held at the U of I's Champaign-Urbana campus on February 23- 24, 2010.



Zone 1 County Engineer of the Year – Richard Lundin from Boone County The 2009 IACE Zone I Engineer is Richard Lundin. Rich received his B.S. in Civil Engineering from the University of Illinois at Urbana-Champaign in 1972 and his M.S. from the UIUC in 1974. He worked at the Winnebago County Highway Department from 1974 to 1993. He has been the County Engineer for Boone County since 1993. Rich has been in the County system for 34 years and as a County Engineer he has been very active on several committees including the NACE 2009 committee and chairing the Computer, Constitution & By Laws and Emergency Preparedness committees. Rich and his wife Jan have one son. They enjoy traveling and all sports.



Zone 2 County Engineer of the Year – Jeff Blue from Champaign County The 2009 Zone II Engineer is Jeff Blue. Jeff graduated in 1989 with a BS Civil Engineering from the University Of Illinois at Urbana-Champaign. He was the Assistant County Engineer in Macon County from 1990 to 1993, a Field Engineer in Champaign County from 1993 to 1994, the County Engineer in Waseca County, Minnesota from 1994 to 2004. He became the County Engineer for Champaign County in 2004. He is a registered Professional Engineer in Illinois and Minnesota. He served in the offices of Secretary, Treasurer, and Vice President for the Minnesota County Engineers Association before moving back to Illinois. Jeff is an active member of the National Association of County Engineers and is the Chairman of the NACE delegation for the National Committee on Uniform Traffic Control Devices. Jeff chaired the 2009 NACE Conference Finance committee and serves as chair of the Champaign County MPO Technical Committee. Jeff received the National Association of County Engineers – Urban County Engineer of the year award in 2009. Jeff and his wife Kathie have two kids. They enjoy following the Illini and their kid's sports.



Zone 3 County Engineer of the Year – Darrell Cates from St. Clair County The 2009 Zone III Engineer is Darrell Cates. Darrell received his Bachelor of Science in Civil Engineering from Southern Illinois University at Edwardsville in 1981. He has spent his entire career in the employ of St. Clair County starting in 1980. He was appointed County Engineer in 2001 after serving over 15 years as Assistant County Engineer. Darrell served as President of the Illinois Association of County Engineers in 2006. He has been active on many committees with the association including as a Director of the Transportation Officials Division of ARTBA. Darrell and his wife Judy have 3 kids. They enjoy traveling, hunting with a camera and watching baseball and hockey.

SPECIAL WASTE

Please remember that it is necessary for project managers to schedule a minimum of six months for projects that require a Preliminary Environmental Site Assessment (PESA). The Central Office Bureau of Design and Environment (BDE) Manual Chapter 27 states that six months is the minimum period of time to allow between the point when the Illinois State Geological Survey (ISGS) receives the request and the time that the final report is sent to BDE. This amount of time is required for the evaluation of Special Waste issues and the identification of Recognized Environmental Conditions (RECs). If RECs are present and a Phase II Preliminary Site Investigation is needed, additional time will be required for field work and laboratory analysis. In order to accommodate an ever increasing number of requests for both State and Local Roads projects BDE sets tight schedules for ISGS

survey work. Due to the increased work load which has more than tripled since February 2009, it is imperative that project managers allow a minimum of six months for completion of the PESA.

If you have any questions please contact Debbra Mehra at 217-785-6068 or Debbra.Mehra@Illinois.gov.



IACE University of Illinois Scholarship Winners

Each year the Illinois Association of County Engineers awards scholarships to existing University of Illinois Civil Engineering students. The Transportation Group at UIUC is pleased to announce that the following four students have been selected as recipients for the 2008 IACE Scholarships:

> Tyler James Matthew Landstrom David Neuheimer Joseph Zeller

Continued from page 3

 Heavy Agricultural Loads on Pavements and Bridges (ISU Engineering Research Institute report, March 1999)

Links to these resources are on the TERRA Web site at www.TerraRoadAlliance.org.

For More Information

For more information about the research in this article, please contact:

 Shongtao Dai, Ph.D., P.E., research operations engineer, Minnesota Department of Transportation, 651-366-5407, Shongtao.Dai@state.mn.us.

Participants

- Minnesota Local Road Research Board (LRRB)
- Minnesota Department of Transportation
- Illinois Department of Transportation
- · Iowa Department of Transportation
- Wisconsin Department of Transportation
- University of Minnesota
- Industry representatives, including equipment providers

The MnROAD "farm loop"

For this study, an entirely new road was built at MnROAD, the "farm loop." The test roadway, constructed in 2007, is typical of many rural, low-volume county roads. One section represented a typical 7-ton road and the other represented a typi-

cal 10-ton road. Testing with several different vehicles has been conducted in the spring and fall seasons since 2008 to capture the seasonal variation in pavement strength and response to heavy loading. So far, 9 vehicles, of a proposed 17 total, have been tested. The existence of a separate test section allows researchers to reconstruct the road as often as needed for testing. Because heavier and wider farm equipment comes out every year, MnROAD hopes to use the farm loop as a national center for testing overweight vehicles from farming and other industries long after this project is complete.

January 2010 "Reprinted with permission from the Transportation Engineering and Road Research Alliance (TERRA) E-News, Vol. 4, No. 1."

FRESHWATER MUSSELS

What You Should Know for Your Project Timeline

By Janel Veile, Bureau of Design and Environment (BDE)

Freshwater mussels play a very important role in the aquatic ecosystem. They are among the best indicators of the water quality and health of a stream or river. According to the October 30, 2009 Illinois Department of Natural Resources (IDNR) Checklist of Endangered and Threatened Animals and Plants of Illinois, there are currently 16 species of mussels listed as endangered and eight species listed as threatened. As these species are all sensitive to siltation and other pollutants, much care must be taken to avoid impacts to their environment during bridge construction or rehabilitation.

In the development of a project, special studies and coordination are required when the action may affect a threatened or endangered species. The Environment Section, BDE, works closely with IDNR and U.S. Fish and Wildlife Service (USFWS) to identify the likelihood of any listed species in the project area. The Illinois Natural History Survey (INHS) then performs mussel surveys to determine the presence of the species. If a threatened or endangered mussel is found, a Conservation Plan is developed and an Incidental Take Authorization (ITA) permit (granted by IDNR) is applied for. This permit process may take up to six months. Once the permit is granted the INHS will relocate any listed species to a suitable habitat, usually upstream, out of harm's way of the project.

The INHS typically performs mussel surveys and relocations in the late summer (August-September). In order to protect the mussels, certain conditions must be met before surveys and relocations can occur.



- Mussels should never be removed from the water during extreme temperature periods, as relocation mortality has been attributed to stress associated with extreme water and air temperatures. Air temperatures should be 12-18° C (53.6–64.4° F) and water temperatures should be 15-23° C (59-73.4° F).
- During cold weather, mussels migrate deeper into sediments, and under these conditions, smaller mussels are often overlooked.
- The detection of mussels in the

substrate requires the use of ungloved hands, and human hands simply do not function well after a few minutes in cold winter streams, making detection of small mussels highly unlikely.

Please keep this information in mind when you are determining your project timeline. As the survey window is small, close coordination between BLRS, BDE and INHS will be necessary to ensure safe and accurate survey results as well as meeting the anticipated construction timeline.

T2 TRAINING CLASS SURVEY It's Time to Plan the 2010-2011 Training Program

The Bureau of Local Roads and Streets' Technology Transfer Center is soliciting local agency interest in classes for the October 2010 to April 2011 training program. Please look over the list and indicate those classes of interest to you or your personnel by filling in the blank with an approximate number of attendees your agency would send if the classes were available in your area. This solicitation will be used by the Center in scheduling the 2010-2011 training program. Every effort will be made to locate specific classes in areas showing the most interest. Classes lacking in interest will be dropped from this year's schedule.

Please complete this class interest survey and mail or fax it to the Center at (217) 785-7296 by **June 30, 2010**. If you have questions regarding class content, please call the Center at (217) 785-2350.

Bridge Construction Inspection (2 days)	 OSHA 10-Hour General Industry (1.5 days)
Bridge Inventory Documentation (1 day)	 Pavement Construction Inspection (3 days)
Bridge Piling (1 day)	 Pavement Maintenance (1 day)
Bridge Repair (1 day)	 Rehab of Streets & Highways Seminar (1 day)
Bridge Safety Inspection (1 day)	 Response Handbook for Incidents, Disasters (1/2 day)
Colors (1 day) (prerequisite before taking classes below)	 Retroreflectivity (½ day)
• Managing People Effectively (1 day)	 Seal Coats (1 day)
• Team Building (1 day)	 Small Drainage Structure Const. Insp. (2 days)
• Cultural Diversity (1 day)	 Snow & Ice Control (1/2 day)
• Conflict Resolution (1 day)	 Street Sweeping (1 day)
Confined Space Awareness (2 hours)	 Structure Info & Management Systems (SIMS) (1 day)
Const. Materials Insp. Documentation (1 day)	 Surveying I-Beginning (3 days)
Culvert Hydraulics (1/2 day)	 Surveying II-Intermediate (4 days)
Context Sensitive Solutions (1/2 day)	 Surveying III-Construction Staking (3 days)
Erosion Control (1 day)	 Surveying IV-Map GPS & St. Pl. Coord. (2 days)
Flagger Training (1/2 day)	 Traffic Signal Maintenance (1 day)
Hazardous Material-First Responder Awareness (1 day)	 Trenching & Shoring Safety (2 hours)
HEC-RAS (3 days)	 Work Zone Safety-Crews (1/2 day)
Highway Jurisdiction/Transfers (1 day)	 Work Zone Safety-Design (1 day)
Highway Signing (1 day)	 Understanding Specifications (1 day)
Highway Engineering Principles (1 day)	 Urban Storm Mitigation/Tree Damage (1 day)
Low Cost Safety Improvement Workshop (1 day)	 You and the Media (1 day)
MFT Accounting and Auditing (1 day)	 Additional Classes
MUTCD (1 day)	

Contact Person_

Agency _

Phone Number

Zip _____



The Technology Transfer (T2) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual state departments of transportation. Its purpose is to transfer the latest state-of-the-art technology in the areas of roads and bridges by translating the technology into terms understood by local and state highway or transportation personnel.

The Illinois Interchange is published quarterly by the Illinois Technology Transfer Center at the Illinois Department of Transportation. Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect views of the Illinois Department of Transportation, or the Federal Highway Administration. Any product mentioned in the Illinois Interchange is for informational purposes only and should not be considered a product endorsement.

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