TECHNOLOGY NEWS
Iowa's Local Technical Assistance Program (LTAP): providing transportation technology transfer for Iowa's cities and counties

March–May 2004

Acronyms in this issue

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
CTRE	Center for Transportation Research and Education (at Iowa State University)
FHWA	Federal Highway Administration
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers

You say "camino," I say "road"

IOWA's paving contractors and local agencies can take advantage of two new training resources for Spanish-speaking workers:

- *English as a Second Language (ESL) Survival Course* (Survival Course)
- *Stepping Up to Supervisor for Hispanic Construction Workers* (Supervisor Course)

These courses were developed by a team of researchers at ISU led by Ed Jaselskis, associate professor of construction engineering, with funding from the Iowa DOT. Augusto Canales, PhD candidate in ISU's Department of Civil, Construction and Environmental Engineering, was a valuable contributor.

Background

According to the U.S. Census Bureau, Hispanics make up 18.8 percent of employees in the construction industry (or 1.8 million workers), and the U.S. Hispanic population continues to grow at a fast clip.

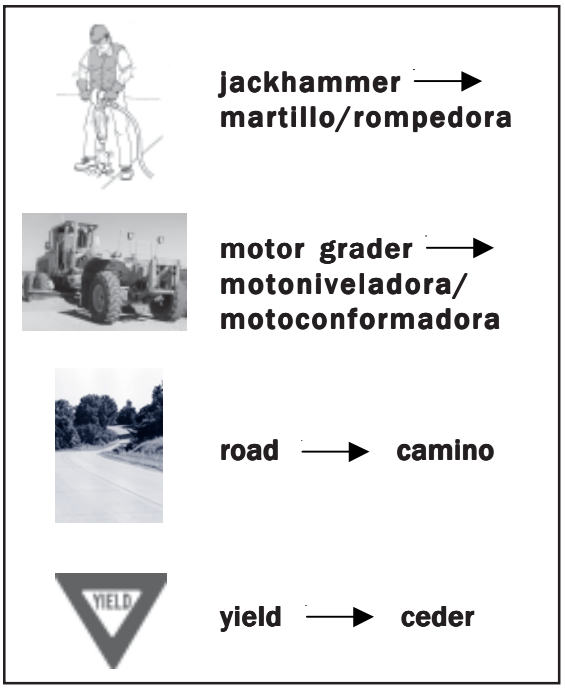
This phenomenon is reflected in many road crews across Iowa.

Sometimes language and cultural differences between Spanish-speaking and English-speaking workers can interfere with good communication, affecting worker safety and efficiency. The two new courses help bridge the communication gap by teaching English language and job skills to Hispanic workers.

Keeping workers safe

A combination of language barriers, varying educational levels, and other factors has resulted in a disproportionate number of job-related injuries and fatalities for Spanish-speaking construction workers. The Survival Course was developed to help reduce the number of accidents and improve overall work efficiency.

Spanish continued on page 2



Examples from vocabulary section of the Survival Course

Preparation of this newsletter was financed through LTAP, a nationwide effort financed jointly in Iowa by the FHWA and the Iowa DOT. Iowa's LTAP is housed and administered at ISU's Center for Transportation Research and Education (CTRE).

The mission of Iowa's LTAP: To foster a safe, efficient, environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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Spanish continued from page 1

The Survival Course teaches an English vocabulary of construction-related terms in a culturally meaningful format. The course also helps participants span the cultural divide by

- explaining why safety is important and illustrating how cultural differences can play an important role in safety issues.
- incorporating teaching methods found in Hispanic countries to make it easier for employees to learn and retain the information.
- encouraging supervisors to hire instructors with multicultural experience in the construction sector.
- encouraging supervisors to combine course content with on-the-job practice to improve language skills and safety practices.

Preparing future supervisors

Moving from performing job functions to delegating them requires a new set of skills. The Supervisor Course helps prepare Hispanic employees transitioning into supervisory roles.

The supervisor training course focuses on three areas: self-management, managing individuals, and teamwork.

Reciprocal training

The ISU team is now developing a training program that teaches basic Spanish to English-speaking supervisors, focusing on job-related vocabulary and situations.

For more information

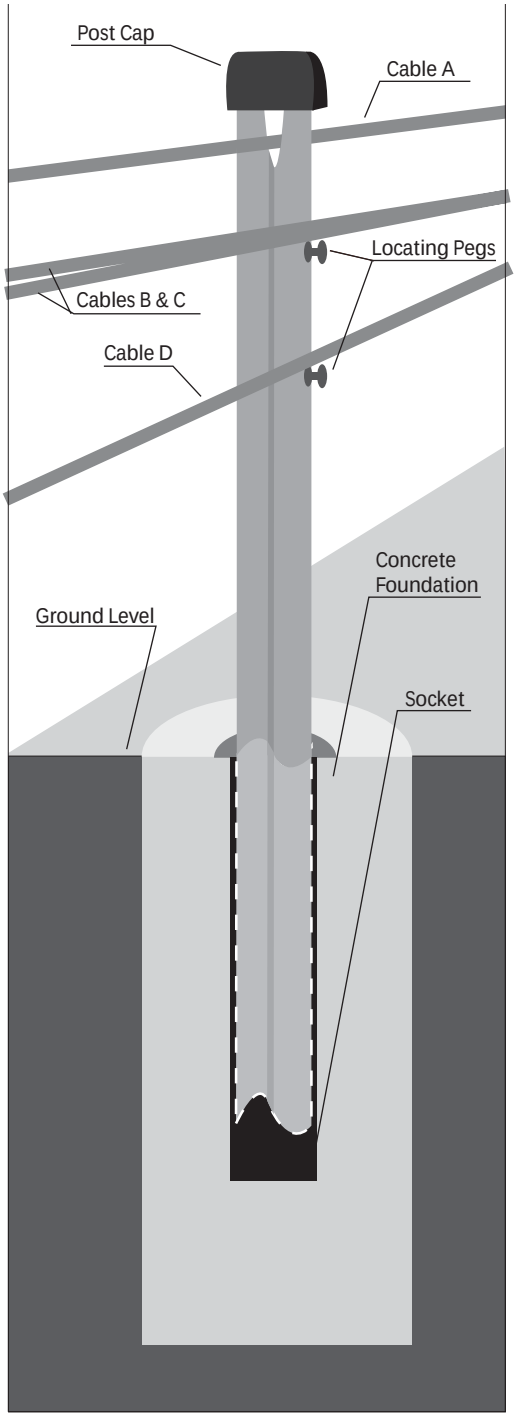
To bring *English as a Second Language (ESL) Survival Course* or *Stepping Up to Supervisor for Hispanic Construction Workers* to your road workers, contact Augusto Canales, 515-294-7531, acanales@iastate.edu.

For additional information, contact Ed Jaselskis, associate professor of civil engineering, ISU, 515-294-0250, ejaselsk@iastate.edu, or Charles Jahren, associate professor of civil engineering, ISU, 515-294-3829, cjahren@iastate.edu. •

New guardrail system should save lives

A NEW TYPE of median cable barrier has recently been installed along a 3.5-mile stretch of I-35 between Des Moines and Ankeny at a cost of $330,000.

Cables continued on following page



This cutaway installation view of the median cable barrier is not necessarily to scale.

Cables continued from previous page

Manufactured by Brifen USA Inc., the system consists of four high-tension cables. Three cables weave back and forth between posts; the fourth runs through slots at the tops of the posts.

The posts are designed to bend or break on impact. They are installed in metal sleeves, which are embedded in concrete foundations (see figure).

Advantages of the new system

The new system has some distinct advantages over concrete median barriers or other cable systems.

Safety. The cable system prevents errant vehicles from entering oncoming lanes of traffic, thereby reducing head-on collisions.

In addition, the cables absorb the energy of an impact, minimizing injuries or reducing their severity. Even after some posts have been damaged, the cables maintain their tension and can endure another impact if necessary.

The system is NCHRP-350 certified.

Cost. The cost of the Brifen cable barrier system is significantly less than concrete median barriers, which require a paved median and storm sewer.

Quick repair. To repair the system after an impact, the damaged posts are simply removed from the sleeves, new posts are inserted, and the cables are reattached. The repair process can usually be done quickly and without any lane closures or heavy equipment.

Little environmental impact. The new cable barrier system reduces the impact on visual aesthetics and on snow drifting during the winter.

Good results in Oklahoma

Iowa is one of a handful of states using the Brifen cable barrier system. The Iowa DOT has been particularly impressed with the results of an installation in Oklahoma.

In 2001 the cable barrier system was installed along a seven-mile stretch of Oklahoma City's Lake Hefner Parkway, which carries over 108,000 vehicles per day.

In the four years prior to 2001, cross-median crashes had resulted in four fatalities and six injuries. Since its installation, the cable barrier system has been hit more than 150 times, with no cross-median crashes, no fatalities, and no serious injuries.

For more information

Contact William Stein, Iowa DOT design methods engineer, 515-239-1402. •

Editor's note: CTRE does not endorse product lines. The cable guardrail system described in this article is patented by Brifen USA Inc.

Four cables absorb energy from an impact. *Photos courtesy of the Iowa DOT.*

Iowa Department of Transportation

IOWA LTAP Local Technical Assistance Program T² Center

CTRE Center for Transportation Research and Education

Iowa State University

Blended cements improve (and complicate) concrete mixtures for pavements

USING supplementary cementitious materials (SCMs), like ground granulated blast-furnace slag (GGBFS) and fly ash, in concrete mixtures for pavements can improve concrete workability, durability, and long-term strength.

However, experience shows that concrete performance varies with the source and proportion of SCMs used. In addition, SCM concrete often results in slower hydration, which can be an asset in hot weather but a challenge in colder weather.

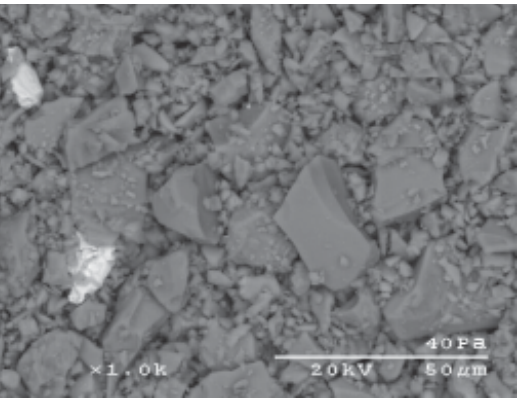
These are some of the findings of a recent research project conducted by a team of researchers at ISU led by Kejin Wang, assistant professor of civil engineering.

Advantages of using SCMs

SCMs are not used as cements by themselves in concrete mixtures for pavements. In Iowa, most blended cements used for pavement concrete contain 20–35 percent GGBFS , together with15 percent Class C fly ash.

Pavement owners and contractors can appreciate the advantages of using SCMs in concrete:

- SCMs are generally less expensive than portland cement.
- SCMs can improve certain concrete properties, such as workability, impermeability, and ultimate strength.
- SCMs can improve concrete durability, including enhanced resistance to alkali-silica reactions, corrosion of steel, and sulfate attack.



SEM photo of Holcim slag. *Image courtesy of Zhi Ge, ISU.*

General findings

Wang and her team investigated optimum mixture specifications and construction practices for proper use of slag-blended cement and fly ash replacement in concrete mixtures under certain weather conditions.

Among the findings were the following:

- Concrete mixtures containing SCMs generally display slow hydration, accompanied by slow setting and low early-age strength. This can be an advantage during the heat of the summer but can create challenges during cold weather.

  At normal and hot weather conditions, pavement concrete containing fly ash and/or slag has comparable or better performance than concrete without SCMs.

  When paving with SCM concrete in cold weather conditions, however, it is advisable to cover slabs to trap heat, extend the curing time, and/or use accelerators.

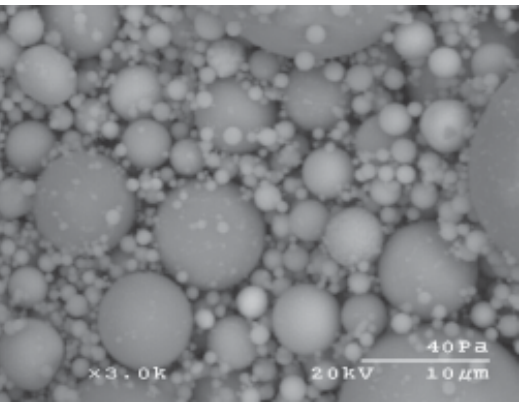
- Fly ash can function as a water-reducing agent, but GGBFS does not. As a result, concrete with both fly ash and GGBFS may have the comparable flowability as concrete mixtures containing only portland cement.

For more information

Contact Kejin Wang, 515-294-2152, kejinw@iastate.edu. The complete report, *Evaluating Properties of Blended Cements for Concrete Pavements*, is available online, www.ctre.iastate.edu/reports/blendedcements.pdf.

See also "Reclaimed Byproducts Boost Concrete Performance," an article in the January 2004 issue of *Better Roads*.

This project was supported in part by the Iowa Concrete Paving Association. •



SEM photo of Lafarge fly ash. *Image courtesy of Zhi Ge, ISU.*

Environmental benefits of SCM

Using SCMs in concrete also has some environmental benefits:

- Most SCMs are industrial byproducts that fall under environmental regulations for waste disposal. Recycling these byproducts in concrete mixtures reduces the amount of GGBFS and fly ash that must otherwise be disposed of.
- Using SCMs in concrete mixtures reduces the need for portland cement, thereby reducing the environmental impacts of manufacturing it (e.g., carbon dioxide emissions at manufacturing plants, and energy requirements for clinker production).

Traffic Safety Improvement Program (TSIP) could fund *your* project

DO YOUR county roads need new signs? Would you like to experiment with a safety feature like rumble strips or a different kind of pavement marking? Not sure where to get the money for these projects?

Since 1987, the Iowa DOT's Traffic Safety Improvement Program (TSIP) has funded city, county, and Iowa DOT safety projects through one-half of one percent of the Road Use Tax Fund (about five million dollars).

Tim Simodynes, TSIP program administrator, says, "We'd really like to see more cities and counties use this fund. It's a great resource that, unfortunately, isn't always used to its full advantage."

What projects are eligible?

Funding is available for projects that fall into one of the following categories:

- **Site improvement** (approximately $3.9 million total/year)—construction or improvement of traffic safety and operations at a specific site with an accident history
- **Traffic control device purchase** ($500,000 total/year)—purchase of materials for installation of new or replacement traffic control devices
- **Safety study** ($500,000 total/year)—transportation safety research, studies, or public information initiatives

Need ideas?

Here are a few projects TSIP has funded:

- making crosswalks more visible
- organizing local multidisciplinary traffic safety groups
- studying pavement marking effectiveness
- improving signing at high crash horizontal curves

Project selection criteria

The Iowa Transportation Commission gives final funding approval for these projects, but the Iowa DOT prioritizes the projects for the commission, based on the following criteria:

- **Site improvements**—by benefit/cost ratio analysis and other criteria
- **Traffic control device purchases**—based on the safety benefits of eligible applications, the annual funding level, and other criteria
- **Safety studies**—based on the project's relation to safety, the annual funding level, and other criteria

Apply for funding

Apply by August 15 for projects beginning summer 2005. Download an application at www.dot.state.ia.us/tsip.htm.

For more information

Contact Tim Simodynes, 515-239-1349, tim.simodynes@dot.state.ia.us. •

Editor's note: The next several issues of Technology News *will feature specific TSIP-funded projects.*

Raising motorcycle safety awareness

FROM 1997 TO 2002, the annual number of motorcyclist fatalities in Iowa nearly doubled, from 26 to 48. Only 58 percent of motorcyclists in Iowa wore a helmet in 2002. Nearly 45 percent of Iowa riders killed in crashes had been drinking.

May is national Motorcycle Safety Awareness Month, and you *can* make a difference.

Send a press release with motorcycle safety tips to your local newspaper

See these resources:

- Iowa Motorcycle Operator Manual: www.dot.state.ia.us/mvd/ods/mcmanual.pdf
- Tips for working with the media: www.ctre.iastate.edu/pubs/special_LTAP/prbook.pdf

Use media kits from the Motorcycle Safety Foundation to reach radio and newspaper audiences

See www.msf-usa.org. Select "News" and then "Motorcycle Safety Awareness Month 2004: Making the Streets Safer for Motorcyclists."

Promote motorcycle licensing and education

Courses and locations in Iowa are listed at www.dot.state.ia.us/mvd/ods/mre.htm.

For more information

See the Iowa Safety Management System's Toolbox, www.iowasms.org/pdfs/toolbox/chapter13.pdf. Also, find a new brochure and safety report at the Iowa Department of Public Safety's website, www.dps.state.ia.us. •

Where's Patrick? ISU student Patrick Stein recently donned a helmet to demonstrate just how "invisible" motorcyclists can be to other drivers. (Can't find him? See page 12.)

Keeping up with Iowa's pave

Omar Smadi, Pavement Management Specialist, CTRE

Participating local agencies have the option of collecting distress data on all *their paved miles.*

THIS ARTICLE is the latest periodic update about current work and future plans for Iowa's pavement management program (IPMP). For readers who are new to *Technology News*, here's a rundown of the program:

What does the program do?

The IPMP provides roadway data and computing tools to help agencies make cost-effective decisions about road repair, rehabilitation, and reconstruction. These tools include

- information on pavement condition for individual pavement sections
- raw pavement distress data (or pavement condition data) from the automated distress collection equipment
- inventory and history information on roadways
- an objective and consistent planning tool to support development of regional and statewide transportation improvement plans
- training on pavement management software and principles
- videologging of roadways

What roads are covered?

The IPMP covers all federal-aid eligible roads in Iowa, whether under state, county, or city jurisdictions.

Participating local agencies have the option of collecting distress data on *all* their paved miles—including non-federal aid eligible roads. So far, nearly 100 cities and counties have had distress data collected on their entire paved system; several more have indicated interest in doing so in 2004.

Who pays for this?

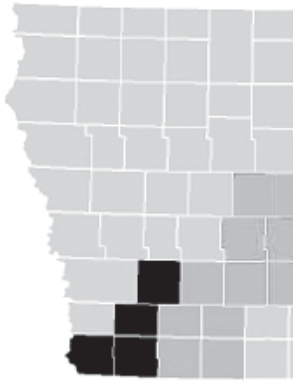
The Iowa DOT funds data collection on county non-federal aid paved roads (approximately 5,500 miles over a two-year period). Cities pay $60 per mile, plus an additional cost (based on the number of miles) for CTRE to set up the system, manage data collection, and deliver the data.

Here's what's com

Delivering 2003 distress data

By the end of June 2004, roadway distress data collected in 2003 will be delivered on CD to participating cities, counties, metropolitan planning organizations (MPOs), and regional planning authorities (RPAs).

Shaded areas on the accompanying map show the geographic areas where 2003 distress data were collected.



Collecting distress data in 2004

This year we are beginning the fifth cycle of distress data collection. All 18 of Iowa's RPAs and eight MPOs are participating in the effort.

To participate in additional data collection for 2004, please send a request through the IPMP website, www.ctre.iastate.edu/ipmp. A notice will also be sent through the Iowa DOT mailing to all cities in the state.

Training

Several training workshops covering the pavement management software and the IPMP GIS tools were conducted last year, and we are planning a very aggressive training program again in 2004 and 2005.

A little history

Funded by, and in cooperation with, the Iowa DOT, CTRE began developing the IPMP in 1994 and implementing it in 1999. Major tasks that have been completed include the following:

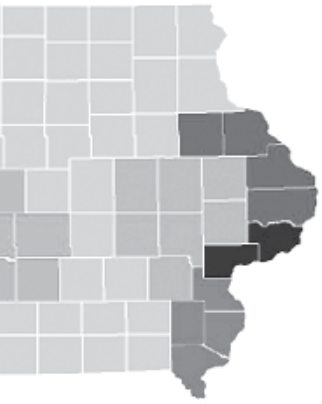
ement management program

ing up in 2004

Training on dTIMS and GIS tools, including the newly developed section tool, will begin later this year.

Again this year, we will also conduct training sessions for RPAs and MPOs in their offices.

A dTIMS users' group will also be formed to allow users to meet and discuss their experiences and insights.



New IPMP website
The IPMP project website was unveiled in 2003. It includes information about IPMP tasks and distress data collection, the workshop schedule, frequently asked questions, and other information.

What service do you need?
The new website also includes an electronic request for information form. We have received several such requests since the website was unveiled. It is becoming the preferred way for local agencies to request information and support. If you have questions, try it out: www.ctre.iastate.edu/ipmp.

For more information
Contact Omar Smadi, 515-2947110, smadi@iastate.edu. •

- development of geographic information systems (GIS) database
- collection of distress data
- selection of pavement management software
- delivery of distress data

Training workshops on the GIS tools and pavement management software are offered annually.

Other services
Video logging. Working with the data collection vendor (Roadware Corporation), CTRE is making video-logging capabilities available to local transportation agencies. Roadware can provide video logs (one view or multiple views) of the right-of-way, as well as pavement images for roads where distress data are being collected.

Through its VISIDATA software, Roadware integrates video and data into a single desktop application. VISIDATA lets you "drive" your network without leaving your office.

Roadway is providing this service to local transportation agencies participating in the IPMP at a cost of

- $10.00 per mile for one right-of-way view
- $20 for panoramic (three views)
- plus an additional $10 per mile for the pavement images

Together, the video logs, images, and VISIDATA software provide transportation agencies with continuous coverage (160 images per mile) of their highway network integrated with the condition data that Roadware already collects. A copy of the VISIDATA software can be purchased for $500.

Last year, eight agencies purchased video log information, and the data and images are already being used in presentations to city councils and county boards of supervisors.

dTIMS pavement management software
dTIMS software is a tool that allows local and regional agencies to use pavement condition information as the basis for determining and prioritizing roadway maintenance and rehabilitation needs and developing cost-effective long-range plans and programs.

Fifty cities, counties, MPOs, and RPAs have purchased dTIMS. The initial cost of the software is $500, plus an additional annual fee for maintenance and update. We still have several copies available. •

To participate in data collection for 2004, send a request through the IPMP website, www.ctre.iastate.edu/ipmp.

Build a better mousetrap: Sign trailer modification

Two views of the trailer

Photos courtesy of the Iowa DOT

Ed Black, automotive mechanic with the Iowa DOT's Council Bluffs garage, ran into a problem transporting signs when the Highway Division changed the recommended sign types from wooden to metal frames (Lang support and Windmaster).

"The old signs had rectangular wooden bases, and our sign trailers were designed to carry those," said Black. "The Lang signs have metal bases and slide-on legs. They wouldn't fit in the sign trailers."

So, Black renovated a sign trailer to accommodate the new signs. With the renovated trailer, only one person is needed to unload signs.

Black used flat steel, Telspar post remnants and one-half inch cold rolled steel to brace the sign legs. To carry more signs, he tilted the trailer's arrow board so that signs stand upright instead of lie down.

He boxed in the back of the trailer for the Windmaster signs and sand bags and used tubing for metal leg storage and the Windmaster signs.

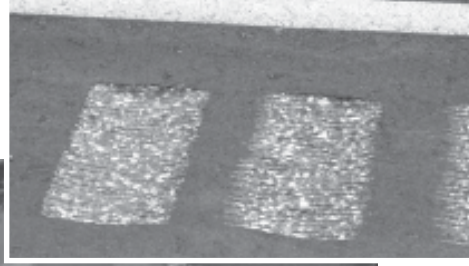
Black spent about $700 for materials and 48 hours renovating two of the shop's four trailers.

Each revamped trailer holds 13 Lang support signs, eight Windmaster signs, and sand bags, compared to the eight wooden signs it held before.

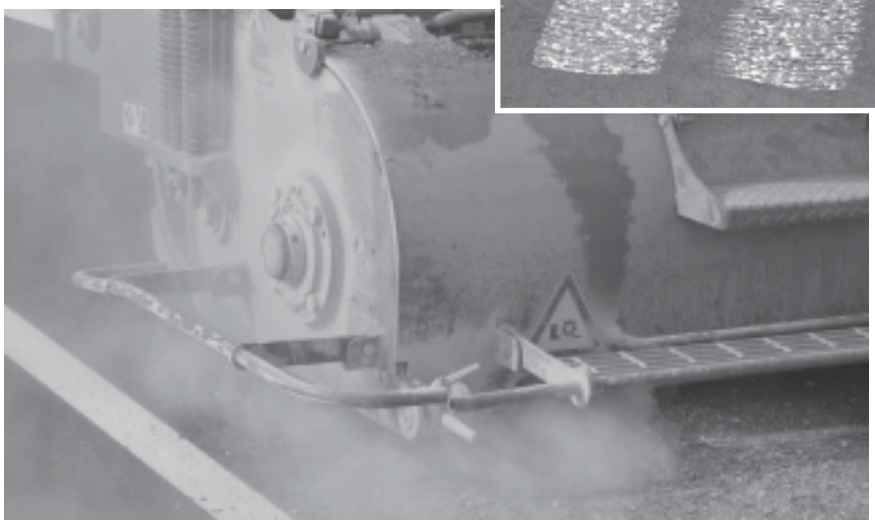
For more information, contact Ed Black, 712-366-0332, edward.black@dot.state.ia.us. •

Editor's Note: "Sign trailer modification" is the third in a series of several winning innovations from the "Better Mousetrap" competition at the 2003 Iowa Maintenance Training Expo. In each issue of Technology News *we are highlighting one of the winners. For information about other winning "mousetraps," see CTRE's website: www.ctre.iastate.edu/ (under the "Services" category).*

Wake up drivers with milled rumble strips



Photos courtesy of the Iowa DOT



THE IOWA DOT is installing a new type of rumble strip on paved shoulders, using a machine that mills, or grinds, the strips into the pavement. Strips are generally about 7 inches by 16 inches by ½ inch deep and are spaced about 12 inches apart (see figure).

Why on shoulders?

About one-third of traffic fatalities in the U.S. are the result of single-vehicle, run-off-the-road crashes.

Some errant vehicles leave the roadway because of driver inattention or drowsiness or because of low visibility due to rain, snow, or darkness. Where there are rumble strips in the shoulder, tire sounds and vibration caused by driving over the strips can alert drivers in time to correct their direction.

Why milled?

Milled rumble strips have proven to be more effective than rolled-in strips—more than 12 times rougher and 3 times louder, according to one study. Passing tires drop into the strip, causing enough tire noise and vehicle vibration to penetrate the cab of a large truck.

Unlike rolled-in rumble strips, which must be installed at the time of paving, milled strips can be cut into any existing paved shoulder in adequate condition.

Milled rumble strips cost roughly 13 cents per foot.

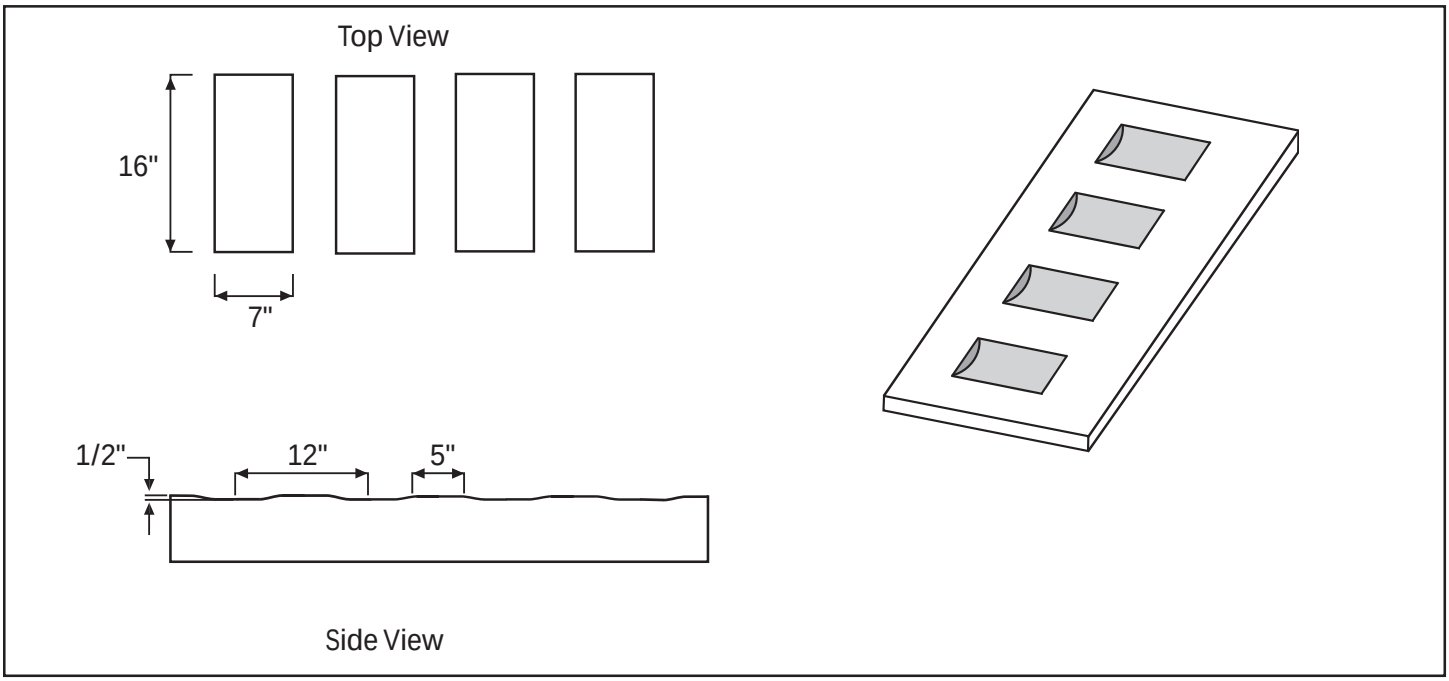
Considering bicyclists' needs

Bicyclists occasionally need to move back and forth between the driving lane and shoulder. Even though bicycles can be ridden over milled rumble strips safely, doing so can be uncomfortable for riders.

So, where bicycles are legally allowed on the roadway, the Iowa DOT leaves 12-foot gaps (no strips) between 48-foot segments of shoulder with rumble strips. The gap allows bicyclists to avoid rumble strips when moving back and forth between the driving lane and shoulder. (The length of the gap was determined using information from a study performed in Arizona.)

For more information

Most of the information in this article comes from the FHWA's safety website, http://safety.fhwa.dot. gov/programs/rumble.htm. To find out more about milled rumble strips in Iowa, contact William Stein, Iowa DOT design methods engineer, 515-239-1402, dan.harness@dot.state.ia.us. •



This illustration of milled shoulder rumble strips is not necessarily to scale.

Take advantage of free crash data analysis and mapping service

THE IOWA Traffic Safety Data Service (ITSDS) at CTRE is helping Iowa's local agencies take the guesswork out of roadway improvement decision-making.

The service provides free crash data analyses and mapping services.

Aurora Avenue, crash location and severity (1996 to 2000)

Only in Iowa

CTRE'S RESEARCH ENGINEER and ITSDS manager Zach Hans says the ITSDS is possible because of Iowa's proactive highway safety community and its vast stores of crash and roadway data. (In fact, Iowa is a National Model for technological and institutional integration of safety data.)

The Iowa DOT is a leader in collecting statewide safety-related data and sharing it across jurisdictions. In addition, the department has developed increasingly sophisticated generations of computer-based tools for integrating and analyzing all that information (e.g., Traffic and Criminal Software, or TraCS).

But not all county and city engineers have a crash data analyst on staff, or the time or know-how to use the tools themselves.

The ITSDS, initiated in 1999, acts as free data analysis "staff" for local agencies. It is the brainchild of Reg Souleyrette, professor of civil engineering at Iowa State University and associate director of CTRE; Joyce Emery, program manager in the Iowa DOT's Office of Traffic and Safety; and Mike Laski, director of the Iowa Governor's Traffic Safety Bureau (GTSB).

The ITSDS is supported by the Iowa DOT and the GTSB, Iowa Department of Public Safety. •

How the service works

The ITSDS conducts small- and large-scale roadway safety analyses, on demand, for local agencies. Requests reflect a variety of interests: law enforcement, engineering, child safety, policy/legislation, etc., and are submitted by phone or e-mail.

Graduate students at CTRE do most of the legwork. They collect appropriate data, employ analysis and display tools, and provide results in convenient formats, often detailed geographic information system (GIS) maps that graphically display layers of data.

In 2003 alone, the ITSDS received 90 requests for data analyses.

A recent example

Michael Ring, P.E., principal traffic engineer for the City of Des Moines, Iowa, thought a specific four-lane, undivided segment of Aurora Avenue might be a good candidate for conversion to a three-lane road with a center turn lane.

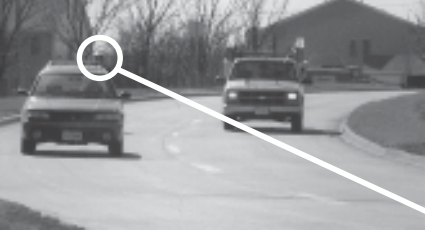
Several such conversions in Iowa during the last few years have resulted in reduced crash numbers and severity.

Ring requested an analysis of crash frequency and types along the segment in question. Hossein Naraghi, who will soon receive an MS degree in civil engineering at ISU, conducted the analysis for Ring.

Ring compared the data and maps generated by Naraghi to "before" data from previously converted segments. The data confirmed that the Aurora Avenue segment was indeed a good candidate, and this summer the city will convert the segment to a three-lane roadway with a center turn lane.

For more information

Contact Zach Hans, GIS specialist, CTRE, 515-294-2329, zhans@iastate. edu. Also, see the ITSDS website, www.ctre. iastate.edu.itsds/. •



Here's Patrick. (See page 5.)

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