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Acronyms in this issue

AASHTO	American Association of State Highway and Transportation Officials	Iowa DOT	Iowa Department of Transportation
CTRE	Center for Transportation Research and Education	ISU	Iowa State University
FHWA	Federal Highway Administration	LTAP	Local Technical Assistance Program
		MUTCD	Manual on Uniform Traffic Control Devices

Flowable mortar helps prevent settling of bridge approaches

IOWA DOT materials technicians and Iowa County engineers have been experimenting with flowable mortar as fill material for bridge approaches. The goal: Eliminate the bump where approach meets bridge deck.

Problem

To install concrete abutments during bridge construction, crews must over-excavate the bank (see photo). When construction is finished, the excavated dirt is commonly used to fill the space under and around the approach slab.

However, it's difficult to completely fill the space and compact the dirt effectively. The dirt generally settles and, with it, the bridge approach. If it settles significantly, moving vehicles experience a jolting thump-thump where the approach meets the bridge deck.

Fix

In recent years Bill Kirk, portland cement (PC) technician for Iowa DOT District 6, and his crew have backfilled four bridge approaches with flowable mortar instead of dirt. This is a new application for flowable mortar, which is commonly used as fill material around or within box culverts and in trenches.

Kirk has discovered that, as bridge approach backfill, flowable mortar has two advantages:

- It doesn't settle. It effectively fills the space and hardens to a durable concrete. Of the four locations where flowable mortar has been used, "... none of the bridge approaches have settled at all," Kirk says.
- It's economical. Kirk estimates that flowable mortar costs only about \$40 per cubic yard, substantially less than the cost of replacing and compacting excavated dirt.

"Recipe"

Flowable mortar is a relatively fluid mixture of sand, water, fly ash, and cement.

One cubic yard of flowable mortar for bridge approach fill:

- 100 pounds portland cement
- 400 pounds fly ash (coal byproduct)
- 2,600 pounds sand
- approximately 67 gallons water
- 3 ounces air agent

This mixture uses coarser sand and more fly ash, air agent, and water than called for in the Iowa DOT's general specifications for flowable mortar. The extra fly ash and air agent help keep the concrete flowable and the sand in suspension.

For more information

Contact Bill Kirk, Iowa DOT District 6 PC technician, 319-366-0446, terry.dunlay@dot.state.ia.us. •



The area excavated to install concrete abutments during bridge construction must later be backfilled. Photo provided courtesy of Iowa DOT District 6.

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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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Benefits of recycled materials for erosion control

RESEARCHERS across the country, including in Iowa and Missouri, have been studying the capability of recycled materials to stabilize new ditch and bridge embankments following road construction.

Successful materials such as compost and reprocessed plastic are now making their way into state and regional design specifications, including the Statewide Urban Design and Specifications Manuals being drafted for Iowa.

Compost

Numerous studies have shown that composted waste materials can make effective slope stabilization materials. One such study was conducted by an Iowa State University research team led by Thomas Glanville, professor of agricultural and biosystems engineering.

The Iowa State researchers collected data on compost's effectiveness as a slope stabilizer, its ability to grow vegetation, and its impact on runoff quantity and quality. The team used compost collected from three of Iowa's 50 to 60 composting sites—biosolids from Davenport, yard waste from Des Moines, and bioindustrial waste from Cedar Rapids.

Compost was applied as 5- and 10-cm deep blankets on highway foreslopes along I-35 in central Iowa and then subjected to simulated rainstorms to observe runoff and erosion.

The research team found that compost is an effective roadside stabilizing material in four ways:

1. Compost absorbs and slows runoff, thereby significantly reducing erosion. In fact, some of the compost tested produced so little runoff that it was necessary to increase rainfall intensities to approximately 100 mm/hour to initiate runoff in less than an hour.
2. Unlike soils that normally need vegetation to provide erosion protection, the composts reduced erosion immediately after application. The researchers point out that this is important for many reasons; for instance, "compost applications on projects completed too late in the year to establish vegetation could provide immediate runoff and erosion control that would help prevent damage that may otherwise occur before the next growing season."
3. Growth of the cover crop on the compost-treated test plots was equal to that on untreated soils during the first summer of testing. During the

second summer, unusually dry weather prevented cover crop growth. During both summers, however, weed growth was significantly lower on the compost-treated plots.

4. Although the biosolids compost contained significantly higher initial concentrations of nitrogen and eight heavy metals than the construction soils at the test site, runoff from the biosolids compost contained significantly lower total quantities of these materials than the construction soils due to the greatly reduced runoff and erosion from the compost.

Using compost as a slope stabilizer is also environmentally friendly because it reduces the amount of waste going to landfills.

A 1988 law passed by the Iowa legislature banned certain types of organic materials from landfills. The ban stimulated construction of many composting facilities throughout the state, resulting in significant compost production. This study was funded in part to help identify new markets for composted organic materials.

Recycled plastic

Recycled plastic has also been shown to have effective slope stabilization properties. Researchers at the University of Missouri-Columbia are currently evaluating stabilization applications of recycled plastic pins (RPPs) made of pressure-molded recycled polyethylene, sawdust, and other byproducts and commonly known as "plastic lumber."

Field testing in Missouri has shown that stabilization using RPPs is a "feasible and economically competitive alternative to other potential stabilization methods." RPPs are particularly promising in their ability to stabilize shallow landslides.

For more information

For information about the compost study, which was funded by the Iowa DOT and Iowa Department of Natural Resources, contact Dr. Thomas Glanville, Iowa State University, 515-294-0463, tglanvil@iastate.edu, or see the project website, www.eng.iastate.edu/compost/.

For information about the RPP study, which was funded by the Missouri Department of Transportation, contact Keith McGowan, 573-751-4641, mcgowk@mail.modot.state.mo.us; a report on the project (RDT 00-007) is available, www.modot.state.mo.us/rdt/Publications.htm. •



Enhancing rural roadside safety

Tom McDonald, Safety Circuit Rider

EDITOR'S NOTE: *Nationally 38 percent of fatal crashes result from single vehicles leaving the roadway and overturning or hitting fixed objects. In 1999, almost 30 percent of vehicle fatalities in Iowa occurred off the roadway. As part of its Vital Few safety initiative, the FHWA wants to reduce or mitigate the effects of single-vehicle, run-off-the-road crashes.*

This article introduces concepts and resources for increasing safety of rural roadsides. A second article in the July–August issue of Technology News will discuss proactive, rural roadside safety programs.

A little history

For decades, transportation agencies generally operated under the assumption that run-off-the-road crashes were caused by driver error and therefore agencies had little responsibility for what happened to motorists once they left the roadway.

In the 1960s, however, responding to a high number of crash fatalities, highway engineers began to consider how fatalities and severe injuries might be reduced if roadsides better accommodated vehicles leaving the roadway.

As a result, engineers developed the concepts of “forgiving roadsides” and “clear zones.”

Forgiving, clear environments

A forgiving environment anticipates drivers' mistakes, allows time and space for making driving corrections, and minimizes potential hazards for errant vehicles. Potential hazards include bridges, poles, trees, guard rails, mailboxes and, most frequently, ditches or embankments.

In short, just about anything in the right of way that can be struck by an errant vehicle is considered a potential hazard.

A clear zone is a transversable area that is adjacent to the driving surface and has no fixed objects. Clear zone widths vary from over 30 feet to 10 feet or less, based on several factors like traffic volumes and speeds, roadway geometrics and classification, and foreslope characteristics.

Familiar resources

As emphasis on safer roadsides has increased, guidelines for designers and engineers have been developed.

1. The 2002 edition of AASHTO's *Roadside Design Guide* provides guidance in all aspects of roadside design and protective devices. It also addresses unique situations posed by work zones and urban areas.

2. The millennium edition of the MUTCD increasingly emphasizes less potentially hazardous roadsides:

- In addition to specifying minimum offset distance for signs, the MUTCD (Section 2A.19) requires that sign supports in the clear zone be breakaway, yielding, or shielded with a barrier or crash cushion.
- Similar language can be found in Part 6 for temporary traffic control sign supports in work zones.
- Even Part 5 for low volume roads requires sign supports in the clear zone to be crashworthy.

Resources for local roads

Many roadside safety improvements are simply not cost effective for lower traffic volume roads. Two resources can help:

1. The 2001 edition of AASHTO's *Guidelines for Geometric Design of Very Low Volume Local Roads* acknowledges that most users of lower volume roads (ADT < 400) and certain collector roads are familiar with the roadway and terrain and will adjust their driving practices accordingly.

The guidelines in this document allow great flexibility to designers and engineers in applying minimum standards for roadside safety improvements.

2. The Iowa DOT's Office of Local Systems has developed Instructional Memoranda with Design Aids and has summarized AASHTO guidelines for designing improvements on rural county roads.

This document offers recommendations for features such as shoulder width, slopes, and clear zone dimensions while considering allowable variances for volume, terrain, and road classification.

Iowa initiatives

The aforementioned references provide needed advice for significant improvements such as new construction and 3R work (resurfacing, restoration, and rehabilitation). But roadside safety can also be addressed through specific focused activities, like these in Iowa:

1. In 1989 an initiative was undertaken by Iowa county engineers to flatten driveway slopes on farm to market roads, as part of a 3R project or as an individual improvement. Since that time, approximately 15,000 entrances have been improved or removed in many Iowa counties.

Roadside safety continued on page 4

LTAP Advisory Board

The people listed below help guide and direct the policies and activities of Iowa's Local Technical Assistance Program (LTAP). Contact any of the advisory board members to comment, make suggestions or ask questions about any aspect of LTAP.

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Transportation Planner
Region XII Council of
Governments
712-792-9914



 Iowa Department of Transportation



Center for Transportation
Research and Education

Roadside safety continued from page 3

For that continuing effort, the Iowa County Engineers Association, ICEA, was presented with an Achievement in Transportation Safety Award by the Iowa Traffic Control and Safety Association in 2001.

2. To address potentially hazardous objects in the right of way, Story County has established a policy and adopted an ordinance to ensure that roadsides are as safe as possible. This initiative, described in the July–August 2002 edition of *Technology News*, included a public communications campaign, a detailed inventory of county roadsides, and a plan for removal or mitigation of identified obstructions.

Similar removal/mitigation plans might be prioritized as follows:

- remove potentially hazardous objects
- relocate obstructions outside the clear zone
- redesign objects to permit vehicles to pass over them safely
- replace objects with breakaway or crashworthy designs
- shield obstructions with guardrails or other protective devices

- if feasible, delineate potentially hazardous objects
- if no other option is possible, do nothing and monitor

For more information

AASHTO's *Guidelines for Geometric Design of Very Low Volume Local Roads* (P1616), *Roadside Design Guide* (2002), and the MUTCD: Contact Jim Hogan, Iowa LTAP library coordinator, 515-294-9481, hoganj@iastate.edu.

Iowa DOT's Office of Local Systems Instructional Memoranda with Design Aids and summaries of AASHTO guidelines for designing improvements on rural county roads: See www.dot.state.ia.us/local_systems/publications/county_im/county_im_toc.htm.

Story County initiative: Contact Bob Sperry, county engineer, 515-382-7355, engineer@storycounty.com, www.storycounty.com/engineer/default1.html.

Also see Chapter 17 of Iowa's *Toolbox of Highway Safety Strategies*, "Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road." Contact Mary Stahlhut, Iowa DOT Office of Traffic and Safety, 515-239-1169, mary.stahlhut@dot.state.ia.us. •

Portable utility box

Editor's note: The "portable utility box" is one of several winning innovations from the "Better Mousetrap" competition at the Iowa Maintenance Training Expo in 2002. In each issue of Technology News we're highlighting one of the winners. For information about other winning "mousetraps," see CTRE's website: www.ctre.iastate.edu/ (see "Popular Links").

WHEN FEW vehicles are available for hauling heavy, multi-purpose items, a portable utility box is a handy alternative.

The utility box is maneuvered with chains attached to it and the truck box. Using the box is simply a matter of raising and lowering the truck box. Raise the truck box to lower the utility box to the ground for loading. When ready to haul, lower the truck box and the utility box is lifted up into position, resting against a wooden bumper guard.

The Iowa DOT maintenance crew in Tipton developed the box, which measures 74 inches wide by 52 inches deep by 27-1/2 inches high. The tailgate measures 69 inches by 25-1/2 inches.

The crew manufactured the box with square tubing, channel iron, flat iron, and chain. The materials cost \$400 and labor cost \$600.

For more information about the portable utility box, contact Denny Petersen or Loren Reynolds, Tipton maintenance shop, 563-946-2391. •



Reauthorization: Putting the SAFE in TEA and the training in transportation

AS THE current Transportation Equity Act for the 21st Century (TEA-21) nears its September 30 expiration, many involved in the transportation workforce have grown increasingly concerned that federal financial commitments to homeland security will compromise transportation funding in the upcoming reauthorization.

On May 14, U.S. Secretary of Transportation Norman Mineta unveiled the Bush administration proposal for the next federal surface transportation act. The Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA) calls for a \$247 billion investment over the next six years.

This amount is far short of the \$375 billion sought by the U.S. House of Representatives Committee on Transportation and Infrastructure. Committee Chairman Don Young commended some aspects of the bill; "however," he stated, "there simply isn't enough in the administration's bill to address our nation's growing congestion problems."

The details of SAFETEA are especially critical at this time because of increased demands on the transportation system, growing expectations for its performance, and current concerns for transportation safety and security. Investment in transportation also results in a direct boost to our economy; according to AASHTO, every billion dollars of national highway investment generates 47,500 jobs. With adequate funding, programs such as LTAP create training for the transportation workers in these jobs.

The final details of the transportation reauthorization are yet to be worked out by Congress, but the emphasis will certainly be on improving transportation safety and preserving critical transportation infrastructure. Elements of SAFETEA likely to impact local transportation agencies in Iowa are summarized below.

Transportation safety

- **State strategic highway safety plans:**

Ensure that each state develops and implements a comprehensive, collaborative strategic highway safety plan. The Iowa Safety Management System *Toolbox of Highway Safety Strategies* has been very effective in building a multidisciplinary, multi-jurisdictional approach to highway safety in Iowa.

- **State highway safety improvement programs:**

Implement a highway safety improvement program whereby each state analyzes highway safety problems and opportunities and produces a list of candidate projects for 90 percent federal funding. With the help of CTRE, the Iowa DOT has already developed an effective system for identifying safety improvement candidate locations.

The Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA) calls for a \$247 billion investment over the next six years.

- **State traffic safety information systems:**

Make grants to states that adopt and implement programs to improve their traffic safety information systems, including the collection and analysis of crash data, driver licensing and vehicle registration information, citation and court records related to traffic violations and convictions, emergency

medical services information, and data on roadway characteristics. The National Model, developed in Iowa by CTRE and the Iowa DOT, provides a method for achieving this.

- **Intelligent transportation systems (ITS):**

Establish an ITS research and development program to provide funding for research, development, and testing necessary to deploy advanced technology to improve the safety and performance of the nation's surface transportation systems. Establish an ITS performance incentive program to provide funding to states based on progress in achieving specific milestones related to operational performance; Iowa may qualify for \$14.6 million over six years.

- **State performance-based safety grants:**

Make grants to states based upon the performance of their highway safety programs in terms of (1) motor vehicle crash fatalities, (2) alcohol-related crash fatalities, and (3) motorcycle, bicycle, and pedestrian crash fatalities.

- **State safety belt grants:** Make grants to states to (1) encourage states to adopt and enforce primary safety belt laws and (2) increase the rate of safety belt use.

- **State impaired driving program grants:** Make grants to states that have comprehensive impaired driving countermeasures programs.

SAFETEA continued on page 6

Technology transfer

- **Local Technical Assistance Program:** Continue LTAP to provide training, resources, and assistance to local government transportation workers in Iowa and across the country. (More federal funding is needed to help support this important program—see page 8.)
- **University-Industry-Government Partnerships Program:** Recreate the University Transportation Centers Program as the University-Industry-Government Partnerships Program. The plan proposes to remove earmarked funds for certain specified institutions to ensure an open, competitive process. The new program would require that grant applicants have formal research and education partnerships with at least one private sector partner and at least one public sector government partner. The federal cost share would not exceed 50 percent. One of the current university transportation centers—the Midwest Transportation Consortium—is centered in Iowa at CTRE.
- **Transportation Scholarship Opportunities Program:** Develop the Transportation Scholarship Opportunities Program to provide students with academic tuition assistance and opportunities to participate in cooperative employment programs. This program is expected to improve the US DOT's recruiting efforts at a time when the transportation workforce is suffering significant attrition and understaffing. LTAP is well positioned to provide training for these new transportation workers. CTRE has also started a program to recruit high school students for transportation careers.

Highways and pavements

- **Interstate Maintenance Program:** Change the emphasis on the interstate highway system from initial construction to reconstruction and preservation. Authorize \$339 million to Iowa over six years.
- **Long-Term Pavement Performance (LTPP) Program and Innovative Pavement Research and Deployment Program:** Continue the LTPP Program to research, develop, and deliver technologies for long-life pavements that are safe and cost effective, meet customer service needs, and can be effectively maintained. Continue the Innovative Pavement Research and Deployment Program, which focuses on innovative pavement repair, rehabilitation, and construction. The state of Iowa, Iowa State University, and the PCC Center are leaders in concrete pavement research that benefits motorists across Iowa and the country.

Bridges

- **Highway Bridge Program:** Provide more federal funding to states for replacement and rehabilitation of deficient public bridges. Many bridges in Iowa, including high-cost river crossings, are in need of funding to be replaced. Allow the use of Highway Bridge Program funds for preventative maintenance activities. Authorize \$340 million to Iowa over six years.
- **Long-Term Bridge Performance Program and Innovative Bridge Research and Deployment Program:** Establish the Long-Term Bridge Performance Program to research a new generation of long-term, high-performance, low-maintenance bridges and manage the safety, reliability, and security

of existing bridges. Change the name of the Innovative Bridge Research and Construction Program to the Innovative Bridge Research and Deployment Program to reflect the expanded focus of the program from innovative material technology in the construction of bridges to innovative designs, material, and construction methods in the construction, repair, and rehabilitation of bridges. Iowa State University's Bridge Engineering Center is in a position to contribute to some of these activities.

Transportation security

- Promote interagency cooperation in preparing for transportation's growing role in emergency response and recovery.
- Research and develop transportation-related anti-terrorism measures necessary to safeguard the traveling public, ensure the free flow of goods and services, and protect the infrastructure investment.
- Expand the federal-aid eligibility definitions "construction" and "maintenance" to include transportation-related homeland security projects such as those for detecting potential attacks, preventing actual attacks, protecting the highway infrastructure against attacks and resulting damages, ensuring emergency preparedness, and developing the ability for quick response and recovery.

Environment

- **Air quality:** Restrict Congestion Mitigation and Air Quality Improvement Program funds to projects that reduce emissions through new or enhanced transportation facilities or services. Encourage review of estimated emissions reductions by state and

local air agencies to determine the best project candidates with respect to reducing emissions. Authorize \$43 million to Iowa over six years.

- **Project delivery:** Streamline the environmental review process to improve project delivery.

Funding

- **Funding firewalls:** Ensure that all federal transportation excise taxes are devoted exclusively to transportation purposes through funding firewall mechanisms. Redirect 2.5 cents per gallon of the

ethanol fuel tax currently deposited into the General Fund back into the Highway Trust Fund.

- **State planning and research funding:** Increase the State Planning and Research Program set-aside from 2 percent to 2.5 percent to fund improved data collection by the states.

For more information

The SAFETEA bill and analysis are available at FHWA's website, www.fhwa.dot.gov/reauthorization/.

National, state, and local interest

groups—such as the Iowa DOT, National Association of County Engineers, AASHTO, American Society of Civil Engineers, American Public Works Association, and American Road and Transportation Builders Association—continue to provide their responses and recommendations. For example, ASCE's TEA-21 Reauthorization Action Center website, www.asce.org/govrel/tea3/, provides updates on reauthorization, as well as general background information and links to related websites.

Technology News will provide a follow-up when final details are available. •

Want to contact the federal government re SAFETEA?

U.S. House of Representatives

House Committee on Transportation and Infrastructure
2165 Rayburn HOB
Washington, DC 20515
202-225-9446 (voice)
To contact individual members electronically:
www.house.gov/transportation/

Don Young (AK), Chair
House Committee on Transportation and Infrastructure
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202-225-5765 (voice)
202-225-0425 (fax)
To contact electronically:
www.house.gov/donyoung/opinion_form.htm

U.S. Senate

Senate Committee on Commerce, Science, and Transportation
508 Dirksen Senate Office Bldg.
Washington, DC 20510-6125
202-224-1251 (majority)
202-224-0411 (minority)
www.senate.gov/~commerce/
To contact individual members electronically:
www.senate.gov/~commerce/contact/index.cfm

John Cain (AZ), Chair
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Ernest Hollings (SC), Ranking Member
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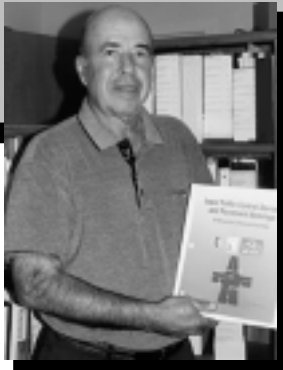
LTAP: Year in review

BECAUSE OF federal support channeled through FHWA, Iowa LTAP provides free or low-cost training and technical support to transportation agencies and workers.

Still, LTAP serves fewer than a third of its potential "customers." Increased funding would help LTAP extend services to more people across Iowa.

The proposed SAFETEA fails to increase LTAP funding to the \$20 million/year needed to meet training needs of local transportation workers across the country; however, FHWA anticipates a modest increase beyond the current level of support (\$10 million/year). Because LTAP centers match every federal dollar they receive with local funds, any increase in federal funding would bring a doublefold benefit.

LTAP funding will be an important item to track as the proposed SAFETEA is debated. •



During the last year, Iowa LTAP provided

- **6 issues of Technology News, each distributed to nearly 3,000 people**
- **61 workshops and other training events, serving 3,200 participants (some attendees participated in more than one event)**
- **nearly 1,000 library loans, including publications and videotapes**
- **more than 300 instances of technical assistance to workers in the field or office**



Here's what people say about Iowa LTAP

"Technology News is a good information source. It brings in second opinions and alternatives to various problems."

Robert D. Fangmann, Cedar County

"LTAP has been an excellent resource for our county and many others."

Jamie Johill, Webster County

"LTAP has easy to find information on many subjects. *Technology News* lets us know what is happening in other areas."

Karla Schoenfield, Bremer County

"We feel that help and information from the LTAP program is very worthwhile."

Les Knowles, Franklin County

"The LTAP library has the latest information available. It is a good source for safety videos and other films."

Don Torney, Cedar County

We appreciate these and other generous comments about Iowa LTAP services written by people who attended various conferences in 2002.

"*Technology News* has included many topics relevant to county engineering, from management to maintenance."

Ron Haden, Calhoun/Sac County

"*Technology News* has relevant articles pertaining to the operational issues that we deal with."

Lance Letellier, Linn County

"Thanks to LTAP's training program, we have better informed employees on signing and road closure flagging."

Don Bohling, Adair County

"LTAP has good training for new, inexperienced help. It is also a good source for ideas for safety and training meetings and for maintenance crew training."

Steve Thomassen, Marshall County

"The library's research documents and reports are useful and otherwise unavailable."

Steven J. Camp, Pocahontas County

"We have used the LTAP library for the last six years. We have used publications about gravel road maintenance, hot mix studies, and full depth asphalt reclamation."

Ben Kusler, Woodbury County

"LTAP provides critical training on traffic issues such as the MUTCD and provides informative ideas from other counties."

Brian Keierleber, Buchanan County

"We have found research for traffic accidents as they apply to roadway conditions, construction, and operation. We have also used your video tapes on snow removal in accident cases."

Charles L. Baule, Baule Engineering

"The motor grader classes have been really valuable to my staff. Excavator safety classes are also well done and valued by my staff."

Mark Nahra, Delaware County

*"We have received technical information that has been used by our design area. We have also received ideas for improvements in our operations from *Technology News*, and our employees receive continuing education at LTAP workshops."*

Steve Gannon, Linn County
