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

January–February 2003

Acronyms in this issue

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

Bettendorf demonstrates new bridge technology

Bettendorf's new 53rd Avenue bridge is the first in Iowa to use a new bridge mat and deck material called fiber reinforced polymer (FRP). It is also the first bridge in the world to use an FRP deck on prestressed concrete beams with composite action.

What is FRP?

FRP is a lightweight, thermoset resin system reinforced with various types of glass or epoxy fibers. FRP is known for its strength and longevity. It is much lighter than concrete, does not corrode, and is, pound for pound, stronger than steel. FRP is a substance that, until recently, has been used only in the chemical and aerospace industries.

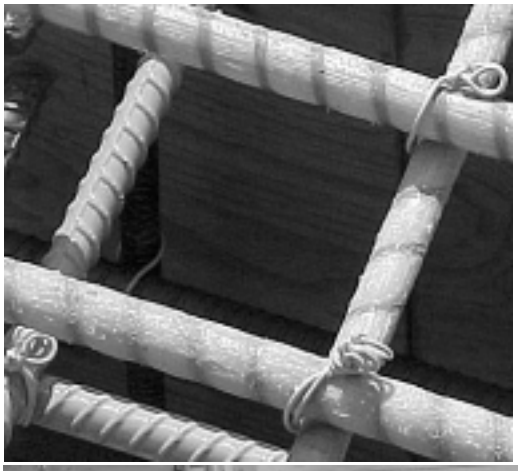
The Bettendorf bridge

Bettendorf engineers have designed and built the 53rd Avenue bridge as a demonstration of technology using FRP to replace conventional materials like steel and portland cement concrete. Wally Mook, director of public works in Bettendorf, is pursuing the project to further field research using FRP in bridges.

The bridge has three spans, each with a different configuration of material for the bridge deck.

- Span 1 has a traditional cast-in-place concrete deck, reinforced by two mats (crisscrossed rods that reinforce the concrete structure) of epoxy-coated steel. It is the control section for the FRP research.
- Span 2 is the same as span 1, except that the concrete deck is reinforced by a top mat of FRP reinforcement as a replacement for epoxy coated steel to avoid corrosion.
- Span 3 has an FRP deck made from prefabricated panels attached to the prestressed concrete beams by steel shear connectors in grout pockets within the deck panels.

FRP continued on page 2



Top: Span 2's concrete deck is reinforced by a mat of FRP. Bottom: Span 3's FRP deck is placed.

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 tranportation system by improving skills and knowledge of local transportation providers though training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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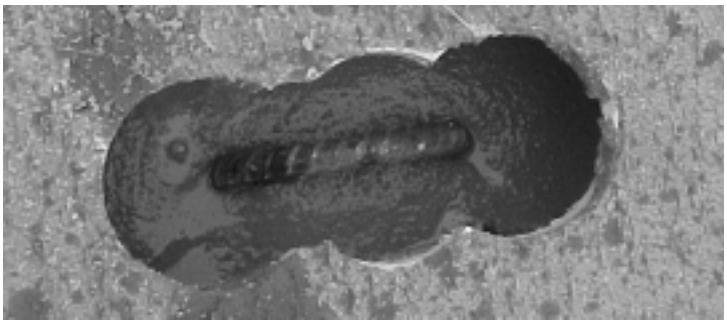
In fall 2003, the bridge will start to carry four lanes of traffic. Currently, the city is building approaches and roads to both sides of the bridge.

Research value

One of the most important aspects of span 3 is that it is the first time engineers have used an FRP deck in a composite action mode with the concrete beams. Composite action works by using shear connectors (epoxy coated steel bars) grouted into hollow portions of the deck (see photo, middle right). As a result, the deck works with the girders to prevent lateral movement and absorb compressive forces as traffic passes over it. Researchers will test how effective the FRP deck works as a support.



Besides supporting the lateral and vertical movements of the bridge structure, the bridge system lends itself to other testing. Since the three spans are in the same environment and undergo the same traffic loadings, researchers can compare the longevity, maintenance, structure, and oxidation of the three spans.

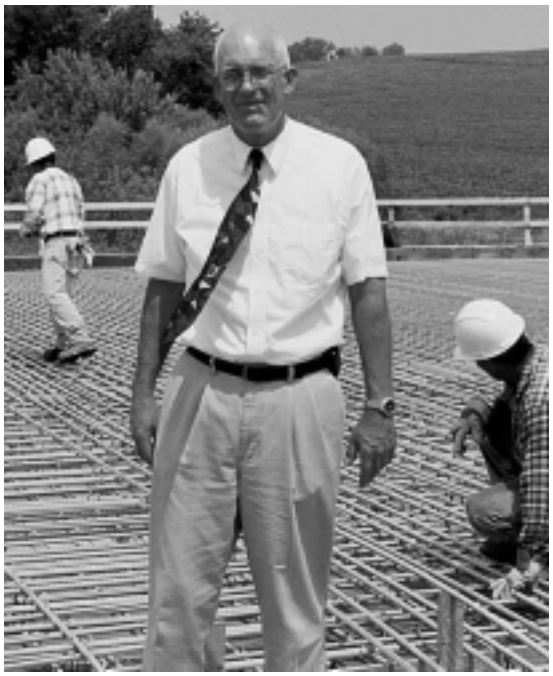
Top: Unlike concrete that must be formed on-site, FRP deck slabs are preformed and transported directly from the factory.

Middle: The FRP deck is grouted to sheer connectors attached to the bridge girders.

Cost

The FRP deck costs about $65 per square foot; the concrete deck with the FRP mat, about $35 per square foot; and the traditional concrete deck with all-steel reinforcement, about $28 per square foot.

The 53rd Avenue bridge cost over a million dollars to build. The additional cost of the FRP deck was offset by a grant from the Innovative Bridge Research Construction (IBRC), an FHWA initiative that helps local engineers develop bridge innovations.



Wally Mook, City of Bettendorf public works director, during construction of the 53rd Avenue bridge deck.

FRP benefits

In spite of the high costs associated with FRP, Mook anticipates that its use will save money in the long run, for several reasons.

He anticipates reduced maintenance costs and need for deck replacement and/or bridge replacement. Installing prefabricated FRP deck panels takes much less time than constructing traditional decks, saving labor costs and reducing the need for traffic detours during construction, an intangible project cost that can be significant in high traffic areas.

For more information

For more information on FRP bridge materials or the 53rd Avenue bridge, go to www.bettendorf.org/publicworks/ibrc.html or contact Wally Mook, 563-344-4128. For more information about the IBRC, go to http://ibrc.fhwa.dot.gov/. •

Iowa River bridge meets environmental challenges

THE DESIGN and construction methods for a new bridge across the Iowa River have earned the Iowa DOT the FHWA's Environmental Quality Award for their low impact on the surrounding environment.

Background
Highway U.S. 20 through Hardin and Grundy Counties consists of a two-lane road weaving through small communities. In 1996 a construction site was finalized for the bridge that allows U.S. 20 to become a more direct east/west route between I-35 and Dubuque.

Located near the town of Steamboat Rock, the bridge spans the Iowa River in a primitive area called the Iowa River Greenbelt. The greenbelt houses several endangered plants and animals such as bald eagles, a rare northern monkshood plant, and several types of freshwater mussels.

To protect these species, the Iowa DOT imposed restrictions on the design and construction of the bridge that provided a challenge for designers and builders.

Environmental constraints
The contractor, HNTB Technology Group, constructed the bridge according to the following Iowa DOT restrictions:

Avoid disturbing bald eagle roosting habits. The Iowa DOT hired a consulting firm to monitor the roosting habits and make sure that construction activities (such as noise) were not disturbing the eagles. Restrictions included a possible shutdown of operations during the eagles' roosting months. However, the eagles generally left the area during daylight hours, allowing the crew to work during the day.

Reduce impact on the river valley. Builders avoided construction activities that would disturb the river and vegetation under the bridge. Instead, they used the launched erection method to construct the bridge. Steel girders were constructed in a preparation area known as the launch pit located on a bridge approach. Sections of the deck were constructed in the pit and then individually pushed, using hydraulics, across the already completed spans and put into place.

The piers were constructed (some of them within 10 feet of the river bank) using a metal cylinder drilled into the limestone and filled with concrete. The piers have a foundation only half the size of conventional piers.

Although vegetation had to be removed to construct the piers, most of the valley under the bridge, including the river, remained untouched.

Control erosion. Several layers of silt fences, riprap, wetlands, and a filtration system were installed by engineers to prevent river contamination. Workers removed only those trees under the bridge that would grow higher than the bridge itself and other vegetation that interfered with pier construction.

The highway and bridge will be open for traffic later in 2003.

For more information
Contact Mike LaViolette, HNTB associate scientist, 515-291-9035, mlaviolette@hntb.com. •

The new bridge overlooks the Iowa Greenbelt, an environmentally primitive area that is home to many endangered plants and animals.

Iowa Department of Transportation

IOWA LTAP — Local Technical Assistance Program — T² Center

CTRE
Center for Transportation Research and Education

IOWA STATE UNIVERSITY

LTAP extends services to communities

THROUGH A new partnership with Iowa State University's Extension to Communities, LTAP is expanding its services beyond training and technology transfer for public agencies to transportation-related analysis and advice services for communities, businesses, and organizations.

What kind of services?
Part of LTAP's mission is to foster development of an efficient transportation system that serves communities' economic and social needs. Extension to Communities provides a venue for LTAP staff to become acquainted with communities and organizations around the state, help them identify transportation-related challenges, and get them started in the process of developing solutions.

LTAP can provide preliminary analysis and advice, as well as general traffic monitoring and data collection. It can also develop transportation-related training events specifically designed for a community's or organization's needs.

"LTAP instruction and assistance is not limited to government agencies," says Duane Smith, Iowa's LTAP director. By providing advice and short-term services to communities, businesses, and organizations, "we can help them recognize potential [transportation-related] problems."

Current projects
Lakota. When a company planning to build a new ethanol plant in the small railway town of Lakota asked for advice regarding roadway access to the plant, LTAP staff identified a potential problem: Each morning several large trucks delivering corn byproducts to the plant would have to turn left across a major highway and a rail line. This situation could result in traffic and safety problems. LTAP is working with the business to develop solutions.

Johnston. Johnston has asked LTAP to provide a strategy for measuring its transportation system. Specifically, the city is interested in performance measures for arterial streets, traffic signals, and emergency vehicle response time. The results will help the city decide which intersections or arterials to adjust or upgrade.

For more information
Contact Duane Smith, Iowa LTAP director, 515-294-8103, desmith@iastate.edu. •

New direction for LTAP advisory board

TO HELP Iowa LTAP better serve local agencies, the advisory board is assuming a more active role in determining LTAP's direction and activities, acting as a conduit of information between constituents and LTAP, and setting LTAP's annual program.

Why the change?
Traditionally the advisory board, representing LTAP sponsors and customers, has met twice a year to review LTAP's activities, budget, and plans. As LTAP's funding and programming partnerships have evolved, however, so has representation on the board.

Today the board includes representatives of the Iowa DOT, Iowa Division of FHWA, Iowa Highway Research Board, Iowa chapter of the American Public Works Association (APWA), Iowa County Engineers Association, and consultants, all of whom are committed to improving training and technology transfer for their constituents.

What's new?
To take full advantage of the board's breadth of representation, expertise, and experience, Duane Smith, LTAP director, has asked members to become a working, rather than a review, board.

Policy. With the help of the Iowa DOT, the board has established policies regarding travel times for LTAP workshop participants, registration fees, and curriculum (for example, the Roads Scholar program).

Communication. Board members now disseminate information about LTAP activities to their constituents through organizational meetings and other venues, then provide feedback to Smith and the board.

They also champion training needs. For example, when a city maintenance worker died recently while cleaning sewer lines, an APWA liaison on the LTAP advisory board suggested an LTAP workshop about sewer line cleaning. Two, two-day certification workshops were held.

Budget and programming issues. The slowing economy will likely affect Iowa's transportation agencies, making it critical that LTAP resources be carefully targeted to provide the most benefit. The advisory board is now helping to plan LTAP's annual program and budget.

Structure. To facilitate a more systemic approach to fulfilling its new responsibilities, the board has elected its first chair, Wally Mook, director of public works in Bettendorf, and a vice-chair, Bob Sperry, Story County engineer. Each year a new chair and vice chair will be elected from different organizations. Board members serve at least one three-year term and may serve multiple terms.

Up to the challenge
The board's expanded responsibilities are strengthening Iowa's LTAP and its partnerships, according to Smith. "There can be a risk in giving a committee a more active role," he says. "You may get different ways of solving a problem. For us, however, we all work well together."

For more information
Board members and contact information are listed on page 3. For more information, contact Duane Smith, Iowa LTAP director, 515-294-8103, desmith@iastate.edu. •

Efficient guardrail cleaner

To eliminate much of the hand work of cleaning guardrails, the Iowa DOT maintenance crew in Dyersville built a guardrail cleaner and attached it to a skid loader. The cleaner is able to reach under a guardrail and push or pull material out of the way.

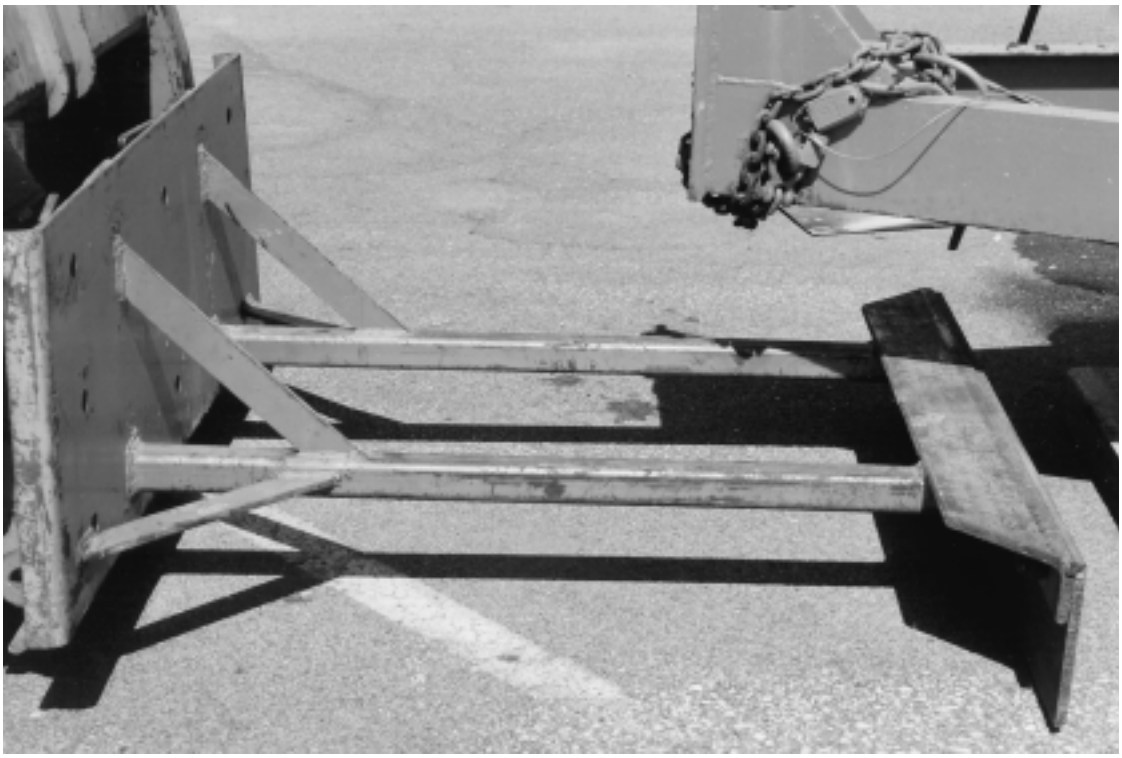
The guardrail cleaner is 44 inches long by 42 inches wide. It attaches to a skid loader with quick-tach plate:

- 5 feet of 3/8" x 2" flat steel
- 8 feet of 2" x 2" square tubing
- 4 feet of 3" x 5" x 1/2" angle

Including paint, the materials cost was approximately $125.

Using the cleaner cuts labor time to clean a section of guardrail by approximately 60 percent. Savings for using a skid loader rather than a backhoe is approximately $11 per hour.

For more information about the guardrail cleaner, contact Steve Benda, 563-875-7615. •

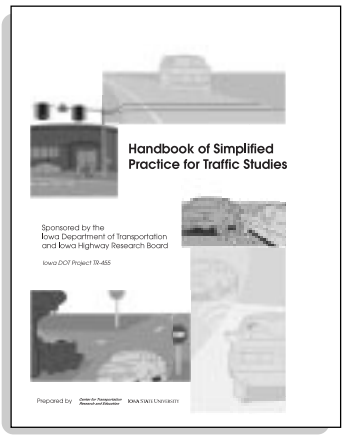


Top: The guardrail cleaner fits easily on a skid loader.
Bottom: The cleaner can reach under guardrails to remove debris.

Editor's note: The "guardrail cleaner" 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").

Transportation

Conducting traffic studies



Is there a location in your jurisdiction about which you have traffic safety concerns? The new *Handbook of Simplified Practice for Traffic Studies* provides easy-to-follow instructions, real-world examples, and model work orders for five traffic studies commonly conducted by Iowa cities and counties.

Making critical studies easy and affordable
Well executed, well documented traffic studies help local transportation agencies make informed project decisions and respond to the public's safety concerns. However, cities and counties often have limited experience and resources to perform these studies.

The new handbook was developed specifically to meet the needs of Iowa's small and mid-sized jurisdictions. It describes straightforward procedures for conducting or contracting out traffic studies. City and county administrators, elected officials, and the general public will benefit from the handbook's nontechnical presentation of standard traffic study procedures and the resulting, well supported recommendations.

Complete, concise information
The *Handbook of Simplified Practice for Traffic Studies* covers five of Iowa's most commonly conducted traffic studies:

1. spot speed studies
2. traffic volume counts
3. sight distance studies
4. crash analyses
5. school zone programs

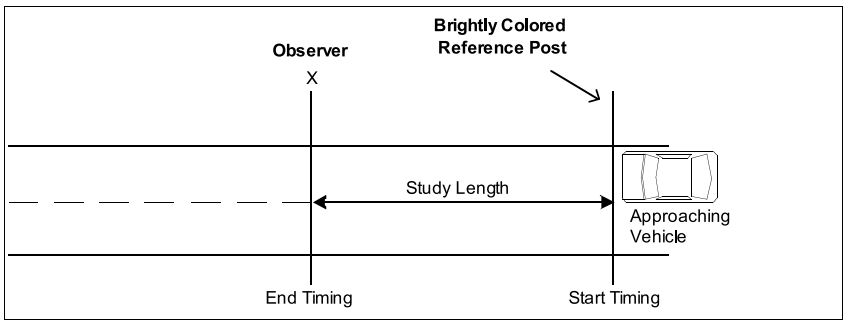
For each study type, the handbook includes an introduction, step-by-step instructions, blank data-collection forms, and real-world examples. Charts, tables, photos, and illustrations clearly communicate concepts, examples, and methods of collecting, representing, and interpreting study results.

The handbook also includes example scopes of work that local jurisdictions can modify or use to hire outside professionals to perform the studies.

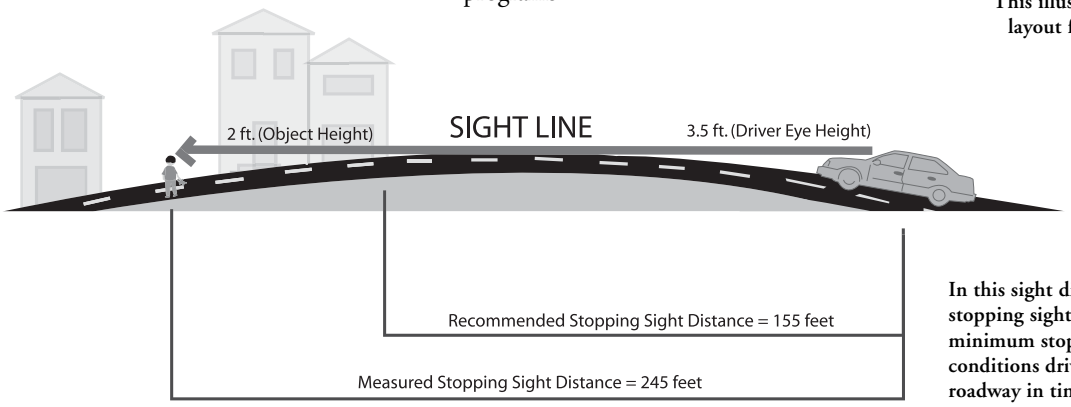
For more information
The traffic studies handbook was developed by CTRE at Iowa State University and sponsored by the Iowa Highway Research Board (project TR-455).

Electronic copies are available at www.ctre.iastate.edu/pubs/traffichandbook/; printed copies may be requested by contacting Traci Stewart, 515-294-8103, stewartt@iastate.edu.

For additional information contact Duane Smith, LTAP director, CTRE, 515-294-8817, desmith@iastate.edu. •



This illustration from the handbook shows the recommended layout for conducting a spot speed study using a stopwatch.



In this sight distance study example, the measured (actual) stopping sight distance is greater than the recommended minimum stopping sight distance. In other words, in normal conditions drivers should be able to see an object in the roadway in time to stop before hitting it.

Resources

Accessing safety advice

THE FHWA has initiated a new no-cost service to help public agencies use traffic control devices and the MUTCD effectively. The "Peer-to-Peer for Traffic Control Devices" (P2P TCD) is an easy-to-use venue for practitioners to receive assistance. It

- provides short-term assistance in matters related to traffic control devices,
- addresses specific technical issues in the MUTCD,
- sparks dialogue among professionals in the transportation community, and
- contributes to a safer transportation system.

How does it work?
Local, county, regional, or state transportation agencies request assistance by e-mail or telephone. The program coordinator matches requests with professionals who are experienced and knowledgeable in relevant technical areas; they contact the requesting agencies. Peer assistance is short-term and addresses specific, technical issues.

Tom McDonald, Iowa's safety circuit rider, and Duane Smith, Iowa LTAP director, are among the experts providing peer service.

The P2P TCD program is easy to use. Send an e-mail to P2P@fhwa.dot.gov or call, toll-free, 1-888-700-PEER. To participate in the program on a less formal basis, visit the discussion area on the MUTCD website, http://mutcd.fhwa.dot. gov. •

Managing culverts

A NEW Culvert Management System (CMS) developed by FHWA is available from Iowa LTAP. It has five modules for recording and updating information on inventory, condition, work needs, work funding, and scheduling. FHWA is providing free technical help.

For more information
For a CD (CR52) containing the user manual, program, and program installation software, plus a text version of the manual (P1612), contact Jim Hogan, LTAP library coordinator, 515-294-9481, hoganj@iastate.edu, fax 515-294-0467 (see page 12 for fax form).

For technical assistance, contact Wendy Jogasurya, 703-235-0546, Wendy.Jogasurya@fhwa.dot.gov. •

Intersection safety: more than stop signs and traffic lights

THE FHWA recently distributed a toolkit on intersection safety–related topics. The toolkit consists of briefing sheets (summaries) designed for DOT administrators, local officials, traffic and safety engineers, and law enforcement officers.

The briefing sheets can help transportation and law enforcement officials inform their staffs, city councils, county supervisors, and the general public about basic, yet important intersection safety concepts.

Briefing sheets cover the following topics:

1. national intersection safety problems
2. basic countermeasures
3. pedestrian safety enforcement
4. human-factors issues
5. enforcement
6. traffic-control devices
7. red-light running
8. cameras
9. work zones
10. myth versus. reality
11. resources

For more information

FHWA briefing sheets are online, http://safety.fhwa.dot.gov/fourthlevel/interbriefing/index.htm.

CTRE has published similar summaries answering frequently asked questions from the public regarding traffic and safety, including questions about intersection safety. These are also online, www.ctre.iastate.edu/pubs/tsinfo/index.htm#faq. •

Maintaining signs and sign supports

A NONLINEAR PowerPoint presentation, Maintenance of Signs and Sign Supports, is now available on CD through the Iowa LTAP library. It was developed by the FHWA under contract with Pennsylvania LTAP.

For more information
Contact Jim Hogan, LTAP library coordinator, 515-294-9481, hoganj@iastate.edu, fax 515-294-0467 (see page 12 for fax form). •

Reducing vehicle-utility pole crashes affordably

INCREASING UTILITY POLES' visibility may help reduce vehicle-utility pole crashes. By placing retroreflective tape around the poles, Iowa DOT engineers are exploring a new, low-cost method to increase highway safety.

Ideally, utility poles should be installed outside a clear zone (in urban areas, at least 10 feet from the edge of the road) to reduce the likelihood they will be struck by errant vehicles. However, moving poles already installed within the clear zone is generally cost-prohibitive. Replacing them with fewer, larger poles can be equally costly.

Tom Welch, Iowa DOT safety engineer, is testing the effectiveness of reducing vehicle-utility pole crashes by making poles more visible. In July 2002, inexpensive retroreflective tape was placed on several poles in Muscatine.

Little research has been done on the effectiveness of this technique, but Welch predicts the tape will improve safety by increasing drivers' awareness of poles just as delineating posts and other markings guide motorists.

Welch suggests nailing or screwing self-adhesive tape to the poles, because tape may not adhere effectively to rough or treated wood. Before nailing or screwing anything to utility poles, get permission from the utility company.

For more information
Contact Tom Welch, 515-239-1267, tom.welch@dot.state.ia.us. •

Cutting galvanized surfaces safely

WHEN CUTTING galvanized steel such as posts and bolts, protect yourself from exposure to dangerous fumes that can cause "metal fume fever."

Steel is galvanized by immersion into molten (850 degrees Fahrenheit) zinc. At that temperature, the zinc metallurgically bonds with the steel, forming a coating that slows steel's natural rusting process.

However, when heated, e.g., when cut with a torch, this coating gives off dangerous gases that can make you sick.

Typical symptoms of "metal fume fever" include a metallic taste in the mouth; dry, irritated throat; chills; and fever. Symptoms generally last 12 to 48 hours.

To protect yourself from exposure to sickening fumes,

- use an abrasive saw instead of a torch,
- limit the duration of the work,
- work in a well ventilated area (outside is best, or inside with a fan),
- wear personal protective equipment for your ears, face, eyes, and hands, and
- wear a welder's leather jacket or apron.

If you cut galvanized steel often and/or for long periods of time, use a respirator. To use a respirator in some states, you may be required to take a fitness test, a physical examination, and/or a written program. Check with your supervisor.

This article was adapted from the Vermont Agency of Transportation's *Maintenance and Aviation Division Newsletter*, autumn 2000. Used with permission. •

Iowa DOT receives 2002 Perpetual Pavement Award

EVERY YEAR the Asphalt Pavement Alliance (APA) recognizes heavily traveled flexible pavements whose original hot mix asphalt structure is still going strong after 35 years or more. In 2002, the Iowa DOT received APA's Perpetual Pavement Award for two sections of I-80, one in Cedar County and one in Iowa and Johnson Counties.

The Cedar County section consists of 16 inches of asphalt-treated hot mix base placed directly on a fine-grained subgrade, and four-and-a-half inches of hot mix asphalt surface course. Since its construction in 1962, the pavement has undergone only two surface restoration overlays (in 1976 and 1990).

In the beginning, the prize-winning section in Iowa and Johnson Counties underwent many design changes due to unusually wet soil conditions. In fact, the final two-inch surface course wasn't placed until 1968, two years after initial construction began. Since then, the pavement has been resurfaced only once.

Today, different traffic densities and volumes and different weather conditions require more specialized pavements than the general designs used in the 1960s. The Iowa DOT resurfaces most new asphalt pavements every 10 to 15 years.

For more information
For more information about Iowa's asphalt pavements recognized by APA, contact Michael Heitzman, Iowa DOT bitumen engineer, 515-239-1003. •

Meet experts on today's hot transportation topics

EVERY FRIDAY morning from 10:00 to noon now through early May, Iowa's transportation community is invited to attend free, two-hour seminars at ISU or the University of Northern Iowa (UNI). Seminars feature regional and national experts on a variety of topics emphasizing

- advanced transportation technologies
- transportation asset management

Seminars are alternately broadcast from four midwestern universities: ISU, UNI, University of Missouri-Columbia (UMC), and University of Missouri-St. Louis (UMSL).

See the seminar schedule below. It is updated regularly online, www.ctre.iastate.edu/educweb/scholars.htm.

Locations and contact information
ISU contact: David Plazak, 515-294-8103 or 515-296-0814, dplazak@iastate.edu.

ISU seminars are held in the videoconference room at

CTRE
ISU Research Park, Building 3
2901 South Loop Drive, Suite 3100
Ames, Iowa

UNI contact: Tim Strauss, 319-273-7467, tim.strauss@uni.edu.

Please contact Strauss for seminar location. Seating my be limited. •

What do *you* think about LED signal lamps?

LAST ISSUE'S cover story, "Ames, Bettendorf switch to LED signal lamps," has generated interesting comments about the effect or perceived effect of LED signal lamps on street lighting environments and on drivers' vision compared to the effects of incandescent lamps. Little research has been done on this topic.

Let us know what you think about LED versus incandescent signal lamps. Contact Brett Hansen, CTRE editorial assistant, bwh1@iastate.edu, 515-294-0289. Please include your name, telephone number, and e-mail address.

Date/ Broadcast Location	Topic	Speaker
Feb. 7, ISU	Pavement Management	Katie Zimmerman (Applied Pavement Technologies)
Feb. 14, UMSL	Commercial Airline Operations and Finance	To be announced
Feb. 21, UMC	Observations on the Future of Bridge Technology	Steve Chase (FHWA Turner-Fairbank Highway Research Center)
Feb. 28, UNI	Winter Maintenance Asset Management Technology	To be announced
Mar. 7, ISU	Performance Measures in Highway Corridor Planning and Design	Howard Preston (Howard R. Green Company)
Mar.. 14, UMC	Highway Safety in the Midwest	Gene Amparano (FHWA-NHTSA Liaison, Kansas City)
Mar. 28, ISU	AASHTO Asset Management	John Craig (Nebraska Department of Roads)
Apr. 4, UMC	Asset Management in the Railroad Industry	Ken Welch (Union Pacific Railroad)
Apr. 11, ISU	Advanced Pavement Materials, Analysis, and Design	Robert Rasmussen (Transtec Group, Inc.)
Apr. 18, UMSL	Major Public Transit System Operations and Finance	To be announced
Apr. 25, UMC	Asset Management Deployment in Central Missouri	Chris Yarnell (Cole County, Missouri, Public Works)
May 2, ISU	Advanced Construction Technologies	Ed Jaselskis (ISU) and others