

# Technology

Roads Bridges Transit

Iowa Transportation Center

Iowa State University

# News

August 1993

## Open house marks ITC's move

Displays of transportation technology and a visit from Congressman Jim Ross Lightfoot topped the activities during an open house for the Iowa Transportation Center and the Iowa Energy Center.

Approximately 120 people attended the open house held July 8. Congressman Lightfoot, Del Stromer from Senator Chuck Grassely's office, and Iowa Department of Transportation Director Darrel Rensink all made remarks.

Guests toured the new office spaces and were able to see demonstrations of new transportation technologies. The technology displays included the Iowa Department



Iowa DOT Director Darrel Rensink speaks at the ITC's open house held in July.

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## IDOT examines crack and seat procedure

**By Gary Harris**  
**Secondary Road**  
**Research Coordinator**  
**Iowa Department of**  
**Transportation**

Reflective cracking in asphalt overlays placed on portland cement concrete (PCC) pavement has been a major problem in Iowa. Reflective cracks are a duplication of the cracks and joints of the underlying PCC pavement. Reducing the amount of cracking in an asphalt overlay reduces maintenance and extends pavement service life.

This research project evaluated the crack and seat process and its effect on reducing cracking in the overlay

layer. It examined the effectiveness of different cracking sizes and patterns with different thicknesses of asphalt cement concrete (ACC) overlays (see Table 1, page 5).

The test section was a 2.4 km (1.5 mi) section of Hamilton County road R-33. The 15 cm (6 in) PCC pavement on a 10 cm (4 in) soil aggregate subbase was constructed in 1956. It was 6.7 m (22 ft) wide with contraction joints at 24 m (80 ft) intervals. The 1983 average daily traffic volume of 950 vehicles per day was considered in the design of the test sections. The 1991 average daily traffic was 1,430 vehicles per day, nearly a 50 percent increase.

The project was constructed between June 12, 1986 and June 25, 1986. Mathy Construction Company

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### Inside pages



See page 6 for details!

**Page 2**  
**Some counties reverting**  
**roadsides to prairie.**

# Public likes roadside prairies

By Kim Shelquist  
Editorial Assistant

Keeping up with the changes in roadside management practices can be a full time job for today's managers. A decreasing reliance on herbicides and an increasing trend toward using native plant species are helping to make vegetation control the most challenging aspect of the manager's duties.

"Roadside management is definitely more complicated than ever, and in many ways we're learning as we go. But what we're finding is that once established, these areas are taking care of themselves," Kirk Henderson,

manager of the University of Northern Iowa's (UNI) County Roadside Assistance Office, said.

While it may appear that returning roadsides to native prairie would be an easy task, nothing is further from the truth. An integrated vegetation management program must begin with a complete inventory of all area roadsides, followed by research to determine which plants are most appropriate for use in specific areas. In addition, managers must continue to keep the safety of motorists their first priority.

Managers are finding that public response to the new practices is overwhelmingly favorable, Henderson said. He pointed out that public demand for more environmentally-friendly management practices motivated the changes. Concerns about groundwater contamination, decreasing wildlife habitat, and the disappearance of Iowa's native prairies convinced public officials that the state's estimated 600,000 acres of roadside were a significant resource in fighting water contamination and soil erosion.

One response to these concerns is the Iowa legislature's allocation of funds to UNI to help support Henderson's office. The legislature also provides funds to the Iowa Department of Transportation to support the Living Roadway Trust Fund (LRTF). LRTF coordinator Steve Hol-

land said the program was established by the state legislature to promote more sustainable roadside practices. Sustainable practices create roadsides with long-term viability and reduce needed maintenance while protecting the area's soil and water from erosion and contamination. He said the LRTF offers funding and technical assistance to counties and cities for roadside vegetation management projects. Both Holland and Henderson acknowledge the importance of public opinion in developing an integrated roadside vegetation program.

"I think people are becoming more aware that we've almost lost the prairie that used to cover this state. They're also more aware of the dangers created by extensive chemical use," Henderson said.

Holland pointed out that many of the individuals and organizations participating in the state's "Adopt-a-Highway" program, which was originally designed to keep the state's roadways free of litter, are also expressing an interest in adding wildflower cultivation to their duties.

But wildflower cultivation is just one part of an integrated roadside vegetation program. According to Holland these roadsides will require less chemical use and maintenance in the future, and will control weeds and erosion in a much more efficient manner than existing practices.

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The opinions, findings, or recommendations expressed here are those of the Iowa Transportation Center and do not necessarily reflect the views of the Federal Highway Administration or the Iowa Department of Transportation.



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Holland said there are several reasons why native plants work so well in roadside areas. He said, once established, the plants form an extensive root system which doesn't allow much weed growth. With less weed growth in the roadside, managers can reduce the amount of herbicide application which reduces chemical expense, the possibility of environmental damage, and frees employees for other tasks. In addition to aiding weed control, native species are less susceptible to climate extremes than other grasses which can suffer during periods of drought and prolonged hot weather.

Holland said he hopes the advantages of an integrated vegetation program will help change attitudes and lead to a reduction of what he calls "the mowing mentality."

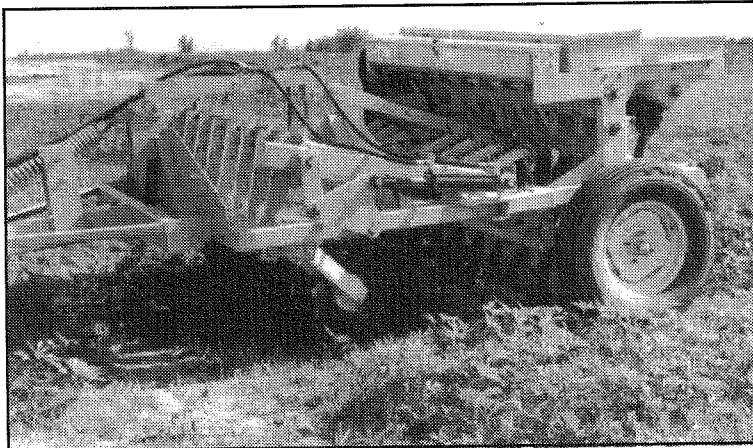
"We'd like to put an end to the idea that roadsides should look like a park where everything is mowed and sprayed," he said. "These are practices that need to be monitored. It's important to make sure managers are getting trained in these new practices and in the use of many of the new products available to cut herbicide use."

Holland said that while there is increasing public pressure to abandon herbicide use, chemicals are still appropriate if used correctly.

"Herbicides have been improved and made so specific to their target weeds that by learning what to use and employing spot spraying instead of the old broadcast methods we can use these chemicals safely and effectively," he said.

Russ Bennett, roadside manager for Johnson County, faces a different challenge. Four years ago the county's board of supervisors banned herbicide use in the county's roadside vegetation control program.

Bennett said Johnson County's roadside program has attracted attention from officials in states such as Texas and Colorado. He added that while many states have extensive wild-flower planting programs, not many



**Seed drills like this one are used to prevent lightweight seeds from being washed or blown away.**

have integrated programs which incorporate native, non-flowering plants. He thinks that, along with the herbicide ban, accounts for the interest being shown in the program.

In addition to the ban on herbicides, Johnson County is actively attempting to return many of its roadsides to native prairie. Bennett estimates that a quarter of his time is spent on this type of planting and that approximately 100 acres of roadside are replanted each year. He said the county is also working on better methods of seed collection from established plants in order to lower the cost of purchasing expensive native seeds.

While not every county will chose to ban herbicides, Bennett said roadside managers need to begin explor-

ing more efficient, environmentally-friendly methods of weed control.

"The use of herbicide in any situation should be evaluated to determine the best use possible, and any county that still uses broadcast spraying for weed control needs to begin that evaluation right away," he said.

Bennett admits that there was minor resistance to the ban, mostly from area farmers who feared weed infestation in their fields, but says now most county residents support the ban. He said since the ban was effected local farmers have had almost no additional weed problems and resistance to the program is fading. Bennett added that the most effective way he can gain public support is to educate people about what his office is doing.

Dave Webber, roadside manager for Story County, agreed and

said that education is the best way to help both land owners and roadside managers through this period of change.

"The most important thing is to keep everything in perspective and remember that changing the current practices will probably be a long road with a few dead ends. But in the end I think we'll have a roadside program that proves to be more efficient, and more beautiful roadsides will be just an added benefit."

For more information on the Integrated Roadside Vegetation Management Program contact Russ Henderson at 319/273-2813. To find out more about the Living Roadway Trust Fund call Steve Holland at 515/239-1768.

# Compressing data frees disk space

There are only two kinds of hard drives – ones that are empty and ones that are full.

That may be an exaggeration. But hard disk space – like nature – abhors a vacuum. For example, here at *Technology News*, an external hard disk of 170 megs was flashing “Cannot Save File, Disk Full” messages after being connected for only two months.

Shrinking hard disk space can be avoided by either buying additional storage devices or doing a better job of managing your current disk space. For space-hogging applications like those that use a lot of graphic files, it's likely that buying additional storage space will be your best option for two reasons. One, there are a variety of devices available and two, prices for these devices are relatively low.

If you don't use space-greedy software but your disk is full anyway, chances are that some thorough spring cleaning is the way to go. The space that can be recovered by deleting unnecessary files and transferring little-used files to floppy disks will surprise you (See “Hard Disks Need Maintenance” in the December, 1991 *Technology News*). Once that's done and you still need more space you may want to consider using compression software.

Compression software uses either one of two tactics to shrink file sizes and free more space on your disk. Driver-level compression programs store data on disk more efficiently and file-level compression programs reduce redundant sections of code. Either method will increase the free space available by about 50 percent, depending on the types of files being

## Microtechnology

By Larry Mendenhall  
Editor, *Technology News*

compressed. Both types will also decompress files when they are needed.

Driver level compression saves space by writing information to the disk differently than DOS. A hard disk is divided into sectors which actually store the information. Each sector can hold 512 characters. If you created a file of 512 characters it would fit neatly in one sector, sector one. If that file, however, contained 513 characters then the extra character would be placed on the next sector, sector two, leaving room for 511 characters. That isn't a problem until the next file is saved. DOS skips to sector three to write the file, wasting the space left over on sector two. Driver level compression makes use of the free space left over on sector two.

Disk-level drivers work in the background. That is, the computer operator is generally unaware of the compression and decompression process. These programs have been developed to the point where the computer operator shouldn't perceive a slow down in his or her operations.

Compressing data at the file level employs a different tactic. A file-level compression program searches a file for redundant characters. For example, it would look at a file and determine how often the character “e” appears. Instead of writing the code for “e” each time, the program writes it once and then places a marker in

each place where “e” appears.

File compression software requires a more active role by the computer operator. To use this type of program, the operator must mark files that he or she wants to compress and tell the program which directory to store it in. The time required to do this depends on the size of the file. While this may not be as convenient as driver-level programs, it is convenient if only certain files need to be compressed. Some users compress only their data files and leave application and system software files uncompressed.

Programs using both methods are reliable. A drawback to compression programs is that disk recovery, optimization, and virus scanning programs don't work with compressed data. In fact, using these tools on compressed files may even destroy your data. Compression software stores data in a proprietary manner that renders disk recovery and disk optimization software such as Norton Utilities useless. Similarly, virus detection software does not scan compressed data and must be turned off when compression software is installed. Some compression programs solve this problem for the user by including disk optimization software.

Even if you decide not to compress your entire hard drive it will still be handy to have a compression program. If you backup your hard disk to floppies (we all backup our hard drives, right?) or use floppies to transfer files from one location to another, then you can use compression software to be able to fit more files or bigger files onto your disks. At *Technology News* compression software reduced a 52-megabyte directory

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# Crack and seat process continued from page 1

of Onalaska, Wisconsin was the prime contractor, with Antigo Construction Company of Antigo, Wisconsin in charge of cracking utilizing a Wirtgen guillotine breaker.

The Iowa DOT Road Rater™, a dynamic, deflection-measuring device used to determine the structural adequacy of pavements, measured the structural capacity of the test sections each year. The tests showed an average 34-38 percent loss of pavement structural capacity prior to overlaying utilizing the crack and seat process (see Table 2).

A detailed crack survey of the underlying PCC pavement was conducted prior to the overlay. Additional surveys performed each year of the project recorded how many new cracks had developed and how much existing cracks had expanded since the previous survey. A major design consideration was the optimum size of cracked pieces. Typically, smaller pieces reduce the amount of reflection cracking due to thermal effects. However, cracked pieces that are too small may reduce the overall structural strength of the concrete.

A cracking size of 60 cm x 90 cm (2 ft x 3 ft) was the most effective in retarding reflective cracks. Sections of that size exhibited an average 33 percent reduction in new and reflective transverse cracking per road station after six years when compared to the control section. However, roughly 42 percent of the

underlying cracks/joints still reflected through after six years. Although the 60 cm x 90 cm (2 ft x 3 ft) cracking pattern seemed to be the most effective at delaying reflective cracks, factors such as environment, pavement age, and traffic all need to be considered for each individual project.

The actual cost for the crack and seat procedure on this project was \$0.66 per square meter (\$0.55/sq. yd.). The cost for other projects may be higher according to the experience of the contractor. The cost effectiveness of additional overlay thickness over cracked and seated PCC pavements may be determined with further research projects.

Although reflection cracking is reduced in the early years after construction, the effectiveness of the crack and seat method diminishes over time.

Much appreciation goes to Hamilton County staff, Mathy Construction Company, Antigo Construction Company, and the Iowa DOT Highway Division for their support in developing and conducting this project.

For more information on this project, contact the Iowa Department of Transportation and ask for HRB report #277, "Cracking and Seating to Retard Reflective Cracking – Hamilton County."

Research Sections				
Section	Cracking Size	Overlay	Sta. to Sta.	Length
1	1.2 m x 1.5 m (4 ft x 5 ft)	10 cm (4 in)	52+79 - 60+59	238 m (780 ft)
2	None	7.6 cm (3 in)	60+59 - 70+59	305 m (1000 ft)
3	None	5 cm (2 in)	70+59 - 80+59	305 m (1000 ft)
4	0.6 m x 0.9 m (2 ft x 3 ft)	7.6 cm (3 in)	80+59 - 106+49	789 m (2590 ft)
5	1.2m x 1.5m (4 ft x 5 ft)	7.6 cm (3 in)	106+49 - 132+39	789 m (2590 ft)

**Table 1: Cracking size, overlay and depth, and length of research sections.**

Structural Capacity					
Frequency	Cracking Pattern	Before C & S	After C & S	After Overlay	% Loss
1 pass/lane & on C	.6m x .9m (2 ft x 3 ft)	2.70	1.75	2.30	35
1 pass/lane & on C	1.2m x 1.5m (4 ft x 5 ft)	2.43	1.54	2.11	37
2 pass/lane	.6m x .9m (2 ft x 3 ft)	2.56	1.51	2.03	41
2 pass/lane	1.2m x 1.5m (4 ft x 5 ft)	2.68	1.88	2.22	30
1 pass/lane	1.2m x 1.5m (4 ft x 5 ft)	2.22	1.41	1.88	36

**Table 2: The loss of pavement strength in terms of cracking size and number of passes.**

## Tips From The Field

# Signs need visual inspection at night

Sign maintenance is a critical function of any street or highway maintenance department. Signs that are difficult to read, especially at night, are a hazard to motorists and a potential liability problem.

Good sign maintenance requires a regularly-scheduled inspection of signs to note which ones have been damaged by vandalism or have simply worn out. Some agencies use reflectometers to judge their signs' reflectivity. But while a sign may look good or generate a good reading on the reflectometer during the day, by night it could be almost impossible to see.

Al Beenken, in charge of sign maintenance in Black Hawk County, suggests that signs be visually inspected at night as well as day. The following tips might help other agencies with their inspections.

1. Make the night time inspection while driving with low beams.
2. Look for recognition of the sign message in a two to three sec-

## Earn \$100 for your 'Tip'

*Technology News* is looking for a few good tips and is willing to pay good money for them.

At the Iowa Transportation Center, we believe that the Iowans who maintain the state's streets and highways have discovered many innovative ways to do their jobs. *Technology News* is anxious to publish these ideas and will

pay \$100 to anyone whose tip is accepted for publication.

A good "Tip From The Field" should be something easy to do or easy to construct in a shop. It should not focus on a commercially-available product nor appear to be an endorsement of any specific product.

For more information call 515/294-9480.

ond span when close to the sign and driving at rural speeds.

3. Make a classification system for your signs. Beenken rates signs as:

- 10 – sign is in excellent condition
- 5 – sign is usable or OK
- 2 – sign is in poor condition. Mark these signs to be

replaced if not representing a high hazard.

- 0 – sign is not usable. Immediate replacement required.

For more information call Beenken at 319/291-2510 or write him at Black Hawk County Engineer's Office, 316 East 5th St., Waterloo, IA 50703-4774.

## Compression software continued from page 4

enough to fit on just nine high-density floppy disks.

Compressed files are a way of life on bulletin board services. It takes less time to either upload or download a compressed file which saves time and connect charges. If you only download files from a BBS you are still going to need a compression

program to decompress the data that you retrieve.

PKZIP, ARJ, and LHA are three compression programs that are available on the Iowa Transportation Center Bulletin Board Service. The ITCBBS is free to county engineers and city public works staff members (see June, 1993 "Microtechnology").

PKZIP is the most commonly used compression program and is shareware. That is, you may try the product for a period of time before deciding whether you like it well enough to pay the fee. To connect to the ITCBBS at 515/294-9784, set your modem to 8 bits, 0 parity, and 1 stop bit.

## For More Information

The videotapes and publications listed in this column are available on a loan basis by contacting Stan Ring, Iowa Transportation Center, 2521 Elwood Dr., Suite 125, Ames, Iowa 50010 or by calling 515/294-9481 Monday, Wednesday, and Friday mornings.

### VIDEOTAPES:

**"Frost Action in Soils"** This videotape discusses the cause and effect of frost action in soils. It contains an excellent graphic modeling of frost action and explains solutions. For loan only. **Request #320V, 10:40 minutes**

**"Loader Backhoe Safety—Part I and II"** These videotapes discuss operator safety aspects when using a backhoe, and operational hazards on the job site. For loan only. **Request #318V, 20:00 minutes or #319V, 20:00 minutes**

**"Full Depth Reclamation"** This videotape by the Asphalt Recycling and Reclaiming Association, describes the process of removing, crushing, pulverizing, and blending with addi-

tives the old flexible pavement to provide a high type base. For loan only. **12:00 minutes. Request #316V**

**"The Best Defense is a Good Road"** This videotape briefly describes management, liability of traffic signs, importance of records, and reenacts court cases in order to understand liability concerns. For loan only. **16:00 minutes. Request #304V**

### PUBLICATIONS:

**"Local Low Volume Roads and Streets"** This ASCE publication is directed to individuals with limited formal technical training or limited experience. It covers all aspects of planning, construction, maintenance, traffic and safety, surface management, and geometric design. An excellent reference source and training vehicle. Multiple copies available free. **Request #888**

**"Manual on Contracting for Vehicle Maintenance Services"** This publication by the Federal Transit Administration will assist any public works agency considering the pro-

urement of vehicle maintenance services from private contractors. Copies available free. **Request #900**

**"Unsurfaced Road Maintenance Management"** This publication by the U.S. Army Cold Regions Research and Engineering Laboratory describes a management system that can be either manual or computer mode. Copies available free. **Request #915**

**"Crumb Rubber Modifier—Workshop Notes"** These notes were developed to provide users with the best understanding of design procedures and construction practices to incorporate scrap tire rubber into asphalt paving materials. Copies available free. **Request #926**

**"Manual for Evaluation, Rehabilitation, and Strengthening of Low Volume Bridges"** This report by the Iowa Highway Research Board shows the most effective techniques for strengthening bridges on low volume roads. For loan only. **Request #898**

### Publication order form

To obtain the materials listed from the ITC, return this form to the Iowa Transportation Center, 2521 Elwood Dr., Suite 125, Ames, IA 50010-8263.

	Title	Index No.	No. of Copies
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Please send a complete listing of all publications from your office.

Please send a complete listing of all audio visual materials available.

## ITC completes move into new headquarters

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of Transportation's video van, Rockwell International's Global Positioning System, a prototype brake-testing device from Hicklin Engineering, and an intelligent kiosk from NCR.

The move to new headquarters has been long awaited by Iowa Transportation Center staff and Director Tom Maze. For the first time since the Center began expanding, staff members are in one location. This makes it easier for the staff to coordinate their efforts in providing all of the Center's services and programs.

The Center's new location off campus at 2521 Elwood Dr. (just south of the Elwood Drive interchange on Highway 30) offers easy access for those who need to consult with Center staff or use our transportation library. The number for the Center, 515/294-8103, remains the same as do those for all staff members.

## Conference Calendar

**Iowa Traffic Control and Safety Association Fall Conference September 16, Best Western, Starlite Village, Ames** Jesse Blatt, noted psychologist for the National Highway Traffic Safety Authority in Washington, D.C., is the speaker. Call Ed Bigelow, 515/294-6384 for more information.

**Excavation and Trenching Safety Workshop September 27, Storm Lake; September 29, Clear Lake; October 4, Cedar Rapids; October 6, Ottumwa; October 8, West Des Moines** Jack Mickle, nationally-known expert in trenching safety, will lead this workshop for crew supervisors, safety coordinators, and backhoe, dragline, and excavator operators. Call Ed Bigelow, 515/294-6384 for more information.

**APWA International Congress, Phoenix, Arizona, September 18-23** Call Beverly Lemon 816/472-6100, ext. 537.

**Equipment Operation and Safety October 7, Davenport** This program is offered by the Iowa Transportation Center in conjunction with the Iowa APWA Chapter and John Deere and Co., Davenport, Ia. For more information call Tom Maze at 515/294-8103.

**Pavement Maintenance Workshop October 14, Fort Dodge; November 2, Waterloo.** This workshop covers the fundamentals of AC and PC maintenance. An excellent course for individuals that manage and perform maintenance on paved roads and streets. Call Jim Cable 515/294-2862.

### And justice for all

Appointment, promotion, admission, and programs of extension at Iowa State University are administered to all without regard to race, color, creed, sex, national origin, disability, or age. Call the Affirmative Action Office at 515/294-7612 to report discrimination.

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