

# roads bridges transit technology news

Local Transportation Information Center  
Iowa State University Engineering Extension Service

November 1987

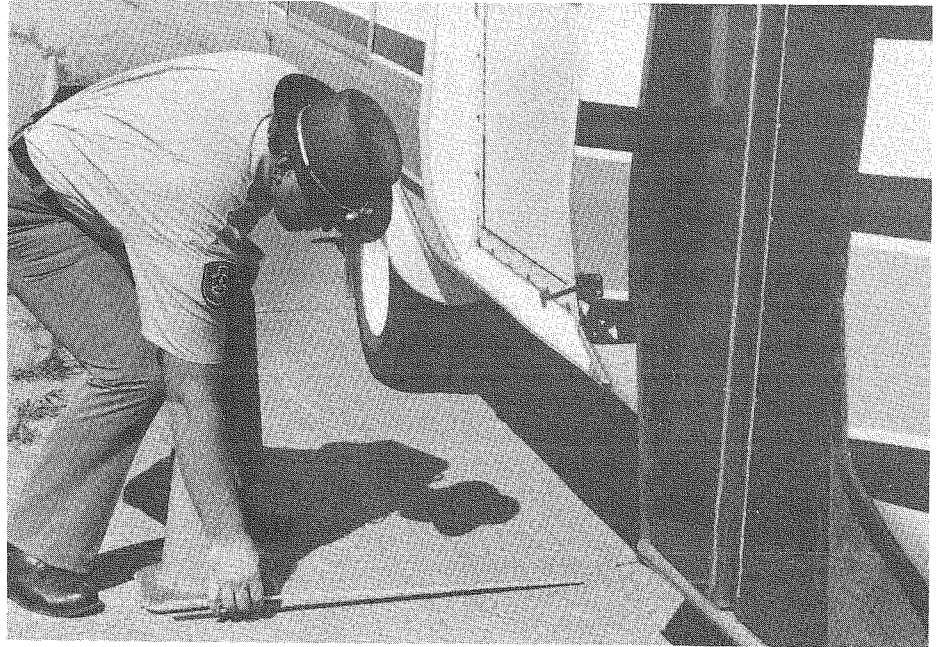
## A smashing success: Iowa's first Public Transit Rodeo

Tooting their own horns in the name of safe public transportation, fifty-one Iowa transit drivers competed in the first Iowa Public Transit Rodeo in June. Cosponsored by the Iowa DOT's Air and Transit Division and the Iowa Public Transit Association, the two-day event was held at Davenport's Mt. Joy Airport.

Driver-entrants represented 20 local transit systems and were selected on the basis of their safety records, professionalism, and vehicle operation skills. Competitions were held in van, small bus, and transit coach divisions on an obstacle course designed as a facsimile of the American Public Transit Association's (APTA) Rodeo course.

According to J. P. Golinvaux, Rodeo liaison for DOT's Air and Transit Division, the Rodeo was developed to encourage safe and skillful transit vehicle operation. "It resulted in some great side benefits, too. Drivers from different systems had a rare chance to interact and share their skills. And the host city and each system with an entrant received

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Curb-stopping distance was one of the vehicle operation skills judged at the Public Transit Rodeo.



Transit van negotiates Rodeo obstacle course designed to test driver precision.

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Milton Johnson named NACE secretary

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considerable positive media coverage. All of Iowa's transit systems were able to publicize their emphasis on safety and their coordination with other agencies," he said.

The Roadeo required coordination between agencies both before and during the event, Golinvaux said. Transit managers from four offices worked together closely to plan the program: Doug Forbes, Davenport; Al Baker, Region 10; Dave Ricketts, University of Iowa—Cambus; and Ermadel Ludwick, Region 9. Competitions during the Roadeo were judged by police officers from Davenport and Bettendorf, and by officers from the Iowa Departments of Public Safety and Transportation.

The top three competitors in each division were awarded engraved plaques and U.S. Savings Bonds. As winner of the transit coach division, Tim Balderidge of the Ames Transit Agency received an all-expense paid trip to represent Iowa and Ames in San Francisco at APTA's International Bus Roadeo.

"For everyone involved, the Roadeo was a success. Because of such positive results, we're already making plans for a second annual Iowa Public Transit Roadeo next May in Fort Dodge," Golinvaux said.

## Rural two-lane highways most hazardous

Rural, two-lane highways make up 97 percent of the total rural highways in the U.S. The accident rate on these highways is higher than that on all other kinds of rural highways except four-lane, undivided roads.

Two-lane, rural highways also have a higher percentage of both head-on and single-vehicle accidents than any other kind of rural highway. An FHWA study of safety problems on the two-lane, rural system revealed the following facts.

- Intersections, horizontal curves, and bridges show the highest probability of accidents.

- Low-cost safety improvements, such as signing and delineation, tend to give high benefit-cost ratios even when the accident effectiveness is small.

- If a signing project reduces accidents to any degree, usually it will be cost-effective.

- High priority should be placed on standardizing traffic control devices, being careful to avoid unnecessary signs.

Although signing and delineation improvements were found to be "highly cost effective," other cost effective improvements included the following:

- Selective removal of trees,

- Placement of centerlines on curves,

- Placement of guardrails on the outside of curves,

- Pavement marking at intersections, and

- Low-cost sight distance improvements at intersections.

The study results indicated that \$4 to \$9 billion in safety funds for two-lane, rural highways may be justified over the next 20 years.

The problems and needs of agencies having jurisdiction over two-lane, rural highways are unique. A vast network of highways must be managed, and on most of the highways the occurrence of an accident is low. Determining whether a section of, or particular spot on a highway truly constitutes a safety hazard is difficult, and treating such a hazard is often not cost effective.

The goal of the federal level, then, is to support the optimization process at the state and local levels by providing training in processes for improving safety; analysis procedures for improving safety; general guidelines on the cost effectiveness of countermeasures; and detailed statistical data on accident rates, accident severeness and kinds, accident-reduction factors, operational benefits, and improvement costs and service lives.

Reprinted from *Northwest Technology Transfer Center Bulletin*, Winter 1985, No. 5.

## Snow and ice control information available

An article containing 17 points to consider when preparing a snow and ice control policy is available from our office. *Avoid Icy Litigation*, is a handy checklist presented at the 1986 annual NHPWA meeting by David L. Minsk of the Cold Regions

Research and Engineering Laboratory. Copies may be obtained by contacting John Moody, Local Transportation Information Center, EES Building, Haber Road, ISU, Ames, Iowa 50011; 515/294-8818.

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*Technology News* is published by the Local Transportation Information Center

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U.S. Department  
of Transportation

Federal Highway  
Administration



## Stan Ring retires after 20 years of service at ISU

After 20 years of teaching in ISU's civil engineering and extension programs, Stan Ring retired in June. More than 185 former students, colleagues, and friends attended his retirement party.

During his tenure at ISU, Ring taught more than 1,000 students, authored or co-authored more than 30 publications on highway design and planning, and headed the co-op program that provides students with work experience in industries. He was responsible for the creation and development of The Local Transportation Information Center at ISU.

"You just don't replace a person as experienced as Stan. Stan has been a super person to work with in the department, and he spent a lot of time with his students," said Dr. Richard Dague, Department of Civil Engineering chair.

Ring received his B.S. (1950), M.S. (1962), and Ph.D. (1973) from ISU, concentrating in civil and transportation engineering. He joined the ISU faculty in 1967 after working 17 years with the Iowa State Highway Commission.

For the past 10 years, Ring has provided continuing education to engineers through ISU's Engineering Extension Service (EES). During that time, programs have tripled due to the demand for continuing education for licensing. According to Ring, his years with extension have been rewarding. "I have made friends throughout Iowa and the nation."

In addition to his hectic teaching and extension schedules, Ring has been involved in more than \$1 million dollars worth of transportation research during the past few years. Projects involved airports, inner-city bus transportation, snow drift configurations modeling for the Iowa DOT, design and construction of low stream crossings, and transportation planning for the FHWA.



Stan and Betty Ring greet well-wishers during his retirement party.

Ring has served as state president for the Iowa Engineering Society and the Iowa Chapter of the American Public Works Association. He also is a member of numerous other engineering and transportation professional groups.

In honor of his dedicated service, Ring has won nearly every award possible including the L. O. Steward Award from the APWA for service in public works, 1967; the ASCE Student Chapter Outstanding Professor Award, 1973; the APWA Man of the Year Award, 1977; the IES Outstanding Service Award in 1980; and the Burlington Northern Award for outstanding faculty achievement in 1986. He also was named Civil Engineer of the Year by the Iowa Section of ASCE in 1986—only the second time that honor has been awarded.

Ring has turned over the reins of his extension programs to Jim Cable, his former student and colleague in civil engineering. Although officially retired, he has agreed to direct the Local Transportation Information Center until his replacement arrives in January.

Ring plans to write a book about the history of transportation and to spend time on his hobbies, woodworking and photography. He and his wife Betty will remain in the Ames area.

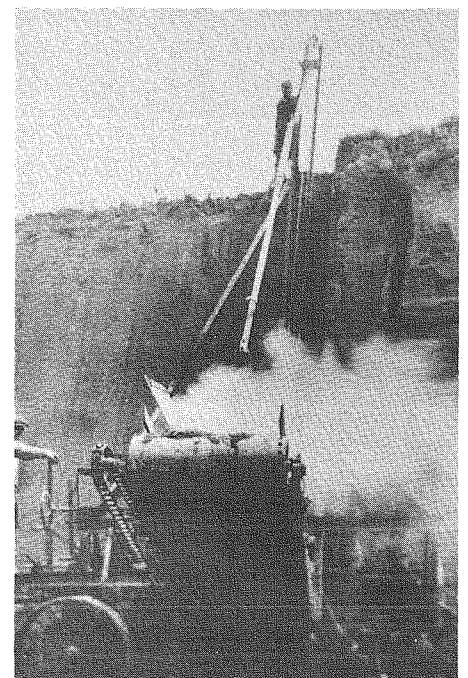
## Unique grading in Iowa's loess hills

Early road builders in western Iowa found that the loess hills presented special grading problems. Unless the side banks were laid back very flat, erosion was a major problem. Vegetation was difficult to start and any flow of water over the backslope might open up a canyon overnight.

Vertical backslopes, however, would stand for years, especially if water flow was routed away from the slope. In fact, special equipment was developed to plane the face of the vertical bank.

Snow drifting was a major problem in these tunnel-like corridors requiring a mobilization of workers to clear a path for traffic. Also, sight distance at intersections left much to be desired.

Only a few of these vertical backslopes remain today as modern grading techniques and safety concerns have changed construction, and practices.



Steam-driven equipment planed embankments of Iowa's loess hills.

## Don't let yourself get in a rut

R. L. Carstens, professor emeritus of civil engineering

In recent years, several state legislatures have moved to reduce the exposure of highway agencies to tort liability claims. For example, in Iowa a new law is intended to preclude suits that are based on failure to erect a sign or otherwise to install a traffic control device. This law was upheld by the Iowa Supreme Court in the case of *Metier vs. State of Iowa*. The allegation in this case was that the state was negligent for failure to install a "Deer Crossing" sign, a contention that was held by the Supreme Court to be precluded by the new statute.

Perhaps this exclusion helps explain a sharp increase in the number of lawsuits alleging another form of negligence, the existence of an edge rut drop-off along the edge of a highway pavement. If an accident occurs, claimants generally will seek some highway defect to explain its occurrence, and an edge rut is often convenient for this purpose.

Edge ruts can occur along any highway pavement with earth or crushed rock shoulders. They tend to occur most frequently on grades and on or adjacent to curves. Heavy rains tend to exacerbate the problem. The depth of the edge ruts that were present in the accident cases

## Article offers tips for the expert witness

"The Traffic Engineer as an Expert Witness," an article by Himmat S. Chadda and Thomas E. Mulinazzi, appeared in the March issue of *ITE Journal* and offers helpful guidelines for those appearing as expert witnesses. The authors describe the activities an expert witness is expected to perform relative to the collection, analysis, and documentation of technical data. They point to the importance of the use of technical references and traffic engineering studies and the ways

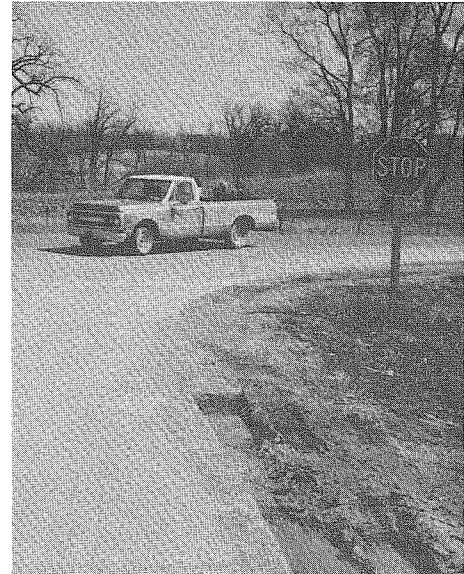
known to the writer has varied from about 2 inches to nearly 5 inches (although the depths tend to become exaggerated in Petitions of Law). Because most cases are settled without trials, there is no clear-cut maximum tolerable limit that can be derived from these cases. However, based on the writer's experience, edge ruts over 4 inches can seldom be defended successfully.

What steps can a highway agency undertake to help alleviate this problem? The most important step is a program of surveillance and timely notification by which the highway authority is advised when an edge rut begins to develop. All highway workers should be constantly on the lookout for edge ruts and should advise their supervisors when one is noted.

Agencies that have policies regarding edge ruts usually state that they will initiate a process of planning shoulder repairs when an edge rut reaches a specified depth, generally 1.5 to 2 inches. Hopefully, this planning process will result in actual repair work being accomplished before the edge rut results in an accident. Only through an active program of surveillance, notification, and timely repairs can the adverse effects of edge ruts be eliminated. The resultant improvement in highway safety should be followed by a reduction in tort liability exposure.

human factors enter in to the development of an accident case. The article also includes a number of "dos" and "don'ts" as they apply to the testimony of an expert witness.

Although the article is too lengthy to reprint here, reprints are available from our office. For a copy of the entire article, call John Moody 515/294-8817 or write the Local Transportation Information Center, EES Building, Haber Road, ISU, Ames, Iowa 50011.



Edge ruts more than 4 inches deep can seldom be successfully defended in court.

## Road improvement funding opportunities

Funding roadway improvements is a constant battle for local governments. However, the Iowa DOT may be able to help. Various state and federal grants or assistance programs are administered through the Office of Local Systems. The types of projects eligible and the status of 1987 funding levels are described here. For more information, contact a DOT District Office or call 515/239-1528.

### RISE funds

A portion of Iowa's motor fuel tax funds the ongoing RISE (Revitalize Iowa's Sound Economy) Program for use on projects promoting economic development through the establishment, construction, improvement, and maintenance of roads and streets. Fifty percent of the approximate \$28 million annual budget is allocated for primary road projects while secondary road projects and city street projects each receive 25 percent. More than 70 county and/or city RISE projects have been approved and 14 have been constructed in a little more than a year.

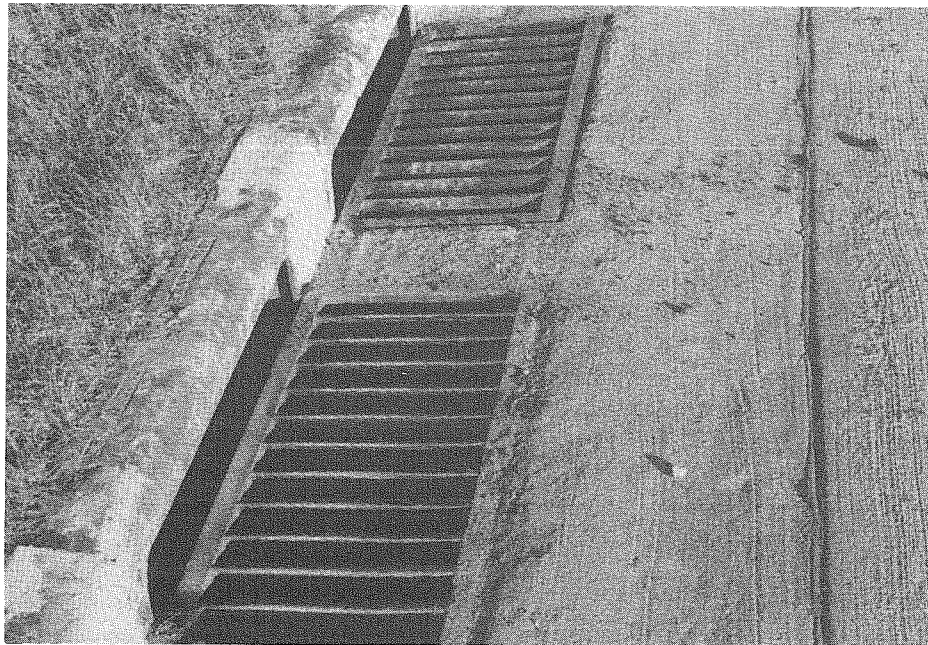
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## tips from the field

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Vane gutter grates, now available from most companies, have slanted vanes or grates that pull draining water into storm drains faster and reduce trash build-up in gutters. The grates reduce the need to send crews to clear debris such as garbage and grass trimmings from grates after each big rain storm. The slanted grates also reduce the likelihood of 10-speed bike accidents since tires do not get caught between the vanes. Several companies supplying the grates are Neenah, Eagle Iron works, and Deeter Foundry, Inc.



Vane gutter grates with slanted vanes help reduce trash build-ups and bicycle accidents.

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Applications for Local Development funding are considered on February 1 and September 1. Those for Immediate Opportunity projects may be made throughout the year.

### HBRR funds

The HBRR (Federal Highway Bridge Replacement and Rehabilitation) Funds are available for structurally deficient and/or functionally obsolete bridges. Unfortunately, the recently passed Federal Aid Highway Act of 1987 reduced the Iowa apportionment this year from \$42 million to about \$30.5 million. Qualifying bridges are funded with 80 percent federal and 20 percent local funds. County bridge projects are determined according to an allocation system and city projects according to a priority system. In the past, about 47 percent of the state's HBRR Fund has been made available to counties while 8 percent has gone to cities.

### FAUS funds

The Federal Aid Urban Systems Funds are designated for street or bridge projects on certain streets on the federal-aid urban system in cities with populations of more than 5,000. Projects are financed with up to 75 percent of federal funds. This year's FAUS apportionment of \$6.5 million is a reduction of \$500,000 from 1986 funding levels.

### FAS funds

Projects on the Federal Aid Secondary System are eligible for up to 75 percent federal funding (with a local match of 25 percent). The Federal Aid Highway Act of 1987 continued this category but reduced Iowa funding from \$14 million to \$12.5 million.

### TEAP

Counties and cities can obtain assistance for studies of various traffic problems through the unique Traffic Engineering Assistance Program. Since 1977, many local governments

have benefited from the advice of a traffic engineering consultant hired by the Iowa DOT with funds from TEAP. This Federal Highway Safety Program has been funded at approximately the same level as last year.

### U-STEP/C-STEP

The Urban-State Traffic Engineering Program and the County-State Traffic Engineering Program join state primary funds with city and/or county funds to improve traffic operation and/or safety problems along the state's primary road system. Spot improvement projects can be funded with 55 percent state funds of up to \$200,000 per project. Linear improvements can be funded from 30 to 60 percent with state funds. By the end of 1986, about 280 U-STEP and/or C-STEP projects had been approved for funding in more than 100 cities and 11 counties.

## Design tips: Transverse joint spacing

Properly designed joints are essential for good pavement performance and deserve detailed attention during the design phase of a project. Proper spacing will prevent transverse cracks that occur due to pavement contraction or the combination of loads and warping stresses. In pavement 8- to 10-inch thick without reinforcement this spacing is usually 15 to 20 feet. A longer joint spacing usually results in intermediate cracks at about the midpoint in the slab.

Such intermediate cracks (volunteer joints) do not substantially effect the load carrying capacity of the pavement and may not have any deleterious effect on the service life. However, such cracks do detract from the appearance of the slab and eventually some spalling will develop contributing to maintenance costs.

For these reasons, and to improve load transfer across the joint, most engineers have learned to keep the joint spacing quite short. Shorter slabs mean less opening of joints during pavement contraction thus providing better and longer lasting load transfer through aggregate interlock. As a rule of thumb, unless local experience with concrete pavement has proved different, the spacing of transverse joints in feet should not exceed 30 times the pavement thickness.

In other words, a 6-inch pavement should have joints at 15 feet or less. Highway pavements jointed according to this rule of thumb should be limited to a maximum joint spacing of 20 feet, particularly if no mechanical load transfer is to be used. Airfield pavements, because of their much greater thickness may have contraction joints up to 25-feet apart.

Longer joint spacings may, of course, be used whenever reinforcement is to be incorporated into the pavement design. Although there are some fairly specific design guidelines for reinforced pavements, in general limit the joint spacing to roughly twice that of a nonreinforced section and you will obtain a high-level of performance. Keep in mind that an intermediate crack will more than likely be formed in the slab, however, the reinforcement will hold it tightly together. No joints are, of course, required in continuously reinforced concrete pavements (CRCP). However, this pavement should be designed according to the standards of the Concrete Reinforcing Steel Institute publication, *Design of Continuously Reinforced Concrete for Highways*.

Reprinted from the American Concrete Pavement Association's *Concrete Pavement Progress*, Vol. 23, No. 3, May/June 1987.

## Paving a gravel road? Fact sheet gives guidelines

Two-thirds of the highways in the United States are unsurfaced or lightly surfaced low-volume roads. Most have evolved from primitive trails that followed the path of least resistance. However, as travel and traffic needs increased, the roads were gradually improved by laying gravel or crushed rock. With the advent of paving, modifications to the foundations were not adequate for the new process. As a result, many roads now have continual maintenance problems.

*When to Pave a Gravel Road*, an excellent fact sheet by the Vermont Local Roads Program, outlines solutions to problems resulting from subbase support, alignment, and drainage problems of gravel roads. Topics covered include a comparison of the advantages and disadvantages of building paved roads versus gravel roads, and a description of the decision-making process recommended for selecting the most appropriate type of construction for a particular community. Tables and graphs are included to help officials in the decision-making steps.

Reprints of the eight-page publication are available from the Local Transportation Information Center, EES Building, Haber Road, ISU Ames, Iowa 50011, 515/294-8817.

## Public works oral history features Ellis L. Armstrong

He served as chief project engineer for the St. Lawrence Seaway Project, consultant to Egypt's Suez Canal, and U. S. Commissioner of Public Roads. The distinguished career of Ellis L. Armstrong propelled him into the history books as one of the leading figures of 20th century American public works engineering and administration.

*An Interview with Ellis L. Armstrong*, recently published by the Public

Works Historical Society, is a fascinating interview that documents the lessons learned during Armstrong's notable career.

The interview relates Armstrong's experiences on many of his major projects. Recollections of the Suez Canal and St. Lawrence Seaway projects graphically depict him in the roles of diplomat, manager, engineer, and friend. His remembrances of his work with the federal government

later in his life give the reader a unique view of the inner-workings of the country's public works administration.

The interview is the seventh in a series of oral histories published by the Society. It is available free to members or at a cost of \$5 for nonmembers from the Public Works Historical Society, 1313 E. 60th Street, Chicago, Illinois 60637; 312/667-2200.

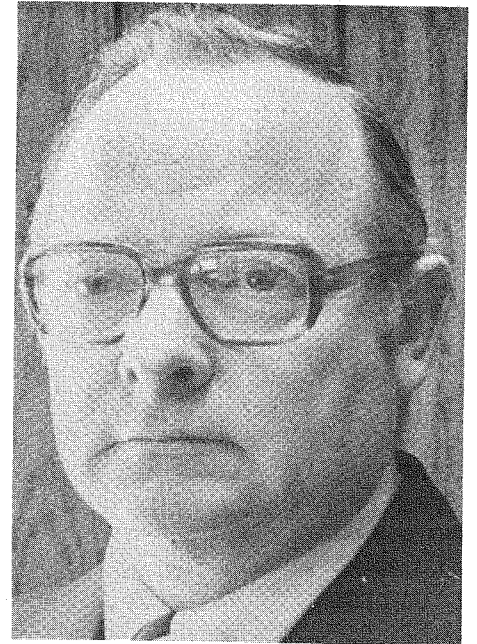
## Milton Johnson named NACE executive secretary

Milton L. Johnson of Ottumwa has been hired as the first full-time executive secretary of the National Association of County Engineers (NACE). Since 1979, Johnson has served part-time as the organization's secretary-treasurer and will continue performing some duties of that position. He will be responsible for maintaining all membership and election records, producing the association's newsletter, and serving as liaison to other national organizations.

Johnson, a 1957 graduate of ISU, served as county engineer in Clayton and Wapello counties. He has been an active leader in NACE for 15 years. In addition to serving as secretary-treasurer, he has held the

positions of board member, regional vice president, and president. He has represented NACE on the American Association of State Highway and Transportation Officials (AASHTO) Geometric Design Task Force since 1976, and has served on the NACE research committee since 1972.

NACE serves approximately 1,300 members in the U.S. and Canada. The organization provides a forum for the exchange of ideas and information aimed at improving the county engineering profession. According to Johnson, goals in the near future will include writing, publishing, and distributing training guides and increasing the association's membership.



## Ultrasonic back-up warning devices compared

Backing into obstacles is a problem that plagues drivers of large trucks and buses. While audible signals have been used to warn other motorists and pedestrians when vehicles are being backed, these devices do not warn the driver that the vehicle is in danger of backing into an obstacle.

The newest wave of technology has resulted in the creation of a safeguard to the dangers inherent in backing up. Ultrasonic warning devices are being installed in fire trucks and other large vehicles by some cities. Currently on the market are three products that range in price from \$300 to \$1,000.

Employing both audio and visual warnings, each model uses a control box that provides the driver with information about potential driving hazards. Two of the three systems have two-stage warning systems, while the third has only a single stage system. The Back Sensor signals when an object is 20 feet to the rear of the vehicle and continues to signal until the object is less than 8 inches away. The Rear Guard model begins emitting a tone when an object is sensed 6½ feet to the rear of the vehicle. When the object comes nearer than 30 inches, the device's tone becomes more urgent. The Tattle Tail also has a two-stage warning system. Its tone begins at 6 feet and becomes more urgent at 24 inches.

A feature that differs significantly is the operational temperature range. The Back Sensor operates between -22° and 150° F and the Tattle Tail operates between -4° and 158° F. However, the Rear Guard operates between 18° and 140° F, making it impractical for severe winter climates.

According to Wally Green of SAF-T-BAC of Glendale, Arizona, the Tattle Tail is the most popular due to its ruggedness and dependability. The Back Sensor sells for \$725; the Rear Guard for \$695; the Tattle Tail for \$389. Installation costs range from \$75 for the Tattle Tail up to \$250 for the Rear Guard.

# conference 1 2 3calendar

**Special note:** The APWA Snow Conference at ISU will not be held this fall because Des Moines has been selected to host the 1988 North American Snow Conference, April 11-13. Everyone is urged to attend this outstanding conference that will feature nationally-known speakers and the most up-to-date information available on snow control topics. Additional details will be available in upcoming issues of *Technology News*.

## **Bridge Inspector's Workshop**

November 9-13

November 16-20

Scheman Building, ISU, Ames  
Technicians involved in bridge inspections and ratings, city and county engineering offices, and consulting firms will have the opportunity to learn more about bridge inspections, ratings, and field laboratories, and to become qualified to inspect bridges. Call Jim Cable at 515/294-2862 for more information.

## **ASCE Transportation Conference**

November 6

Scheman Building, ISU, Ames  
New information will be presented on planning, safety, design, construction, maintenance, and operation practices. Vital to those concerned

with Iowa's highways, rail, air, and water facilities. Call Jim Cable at 515/294-2862 for more information.

## **Highway Applications of Microcomputers**

November 16-18

Austin, Texas

Specifically designed to assist those responsible for state and local roads and streets in learning how microcomputers can be used to enhance operations. Demonstrations of the most effective applications will allow participants to work with proven practical applications available and to determine appropriate hardware and software required. Sessions will be conducted for traffic operations and safety; pavements, construction management, and maintenance management; transportation planning; and bridges, hydraulics, soils, and highway design. The fee is \$100. For more information contact Texas Engineering Extension Service, 409/845-2913.

## **Iowa Good Roads Association Annual Meeting**

November 10-11

Des Moines

## **County Engineers Annual Conference**

December 1-3

Scheman Building, ISU, Ames

## **Asphalt Paving Association of Iowa Annual Convention**

December 3-4

Des Moines

## **ASCE Structural Design Conference**

December 9

Scheman Building, ISU, Ames

## **Iowa Ready Mixed Concrete Workshop**

December 9

Scheman Building, ISU, Ames

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The preparation of this newsletter was financed through the Technology Transfer (T2) Program. The T2 Program is a nationwide effort financed jointly by the Federal Highway Administration and individual State Departments of Transportation. Its purpose is to translate into understandable terms the latest state-of-the-art technologies in the areas of roads, bridges, and public transportation, to local and county highway and transportation personnel.

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

## **And justice for all**

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