roads bridges transit
technology news
Local Transportation Information Center
Iowa State University Engineering Extension Service
January, 1988

Tom Maze named T2 program manager

This month, the Local Transportation Information Center welcomes Tom Maze as our new program manager. Maze replaces Stan Ring who recently retired from 20 years of service at Iowa State University.

Maze also will join the faculty of the Department of Civil Engineering as an associate professor. He will teach transportation planning and conduct research. His areas of specialization include public transit and fleet management.

Maze recently resigned from the School of Civil Engineering and Environmental Science at the University of Oklahoma in Norman.

A native of Minnesota, Maze received his B.S. from ISU in 1975. He earned

the Master's of Engineering from the University of California, Berkeley in 1977, and the Ph.D. in civil engineering from Michigan State University in 1982. Prior to joining the faculty at the University of Oklahoma, Maze taught at Wayne State University. He also served as interim general manager for the City of Norman's rapid transit system. Since 1986, Maze has been a member of APWA's traveling faculty.

"I prefer the practical to the purely academic and I hope to participate in teaching some T2 programs," Maze said. "I've enjoyed teaching short courses and workshops in the summer and look forward to my involvement with continuing education at ISU."

Although Maze foresees no major changes in the center's programming, he may consider offering additional workshops on transit-related subjects, he said.

To ensure a smooth transition in the center's operation, Maze will work closely with Stan Ring during the coming weeks. Ring, who retired officially in June, has directed the T2 program on a part-time basis.

In this issue

A message to municipalities

On October 1, a new contract signed with the FHWA and the Iowa DOT provided for continuation of ISU's Local Transportation Information Center through December 31, 1988. Despite continued funding, there are some very serious concerns about our future.

The Local Transportation Information Center has operated at ISU since January, 1983. During the first years, the center operated with 100 percent federal funding. Later changes required that local sources in the state contribute 50 percent matching funds. The Iowa Highway Research Board (IHRB) sponsored two-thirds of this local-match funding contribution and the remaining one-third was obtained from the Federal Aid Urban Systems funds (FAUS).

For municipalities, this is where the problem occurs. The most recent federal-aid highway act discontinued the use of FAUS funds for these types of educational purposes. As a result, there is no source of local, municipal matching funds available to match the federal aid for the center.

Since 1983, the center has provided regular newsletters, workshops and conferences, publications and other reference materials, and answers to questions from the field. Hopefully these activities benefited those involved in municipal transportation services. To continue these services, it is hoped that local, municipal financial support can be obtained.

Think about it! You may be called upon to help support legislation for the Local Transportation Information Center.

Highway research reports available

The following final research reports on Iowa Highway Research Board projects have been approved for distribution. Complimentary copies are available from Vernon J. Marks, Office of Materials, Iowa DOT, Ames, 50010; phone (515) 239-1447. Be sure to request reports by both title and number.

Special Surface Preparation Prior to Bituminous Overlays (HR-231)
This report presents the results of a study comparing the effectiveness of 3 crack fillers--fly ash slurry, an emulsion, and a rubberized asphalt mixture--in extending pavement life. Discussion includes the construction and performance of each filler material and presents recommendations for use of each.

Method for Estimating the Magnitude and Frequency of Floods at Ungaged Sites on Unregulated Rural Streams in Iowa (HR-268)
This update provides techniques and procedures for estimating the probable magnitude and frequency of floods at ungaged sites on Iowa streams. It also defines regional regression equations that relate size of drainage areas to flood magnitude.

Strengthening of Existing Continuous Composite Bridges (HR-287)
The third in a series of bridge strengthening research projects conducted by ISU, this study concludes that strengthening of continuous, composite bridges is feasible. Post tensioning the positive moment region provided the most effective solution, according to the report.

Pavement Texturing by Milling (HR-283)
This report details findings of a study that looked at alternative methods of surface profiling on rutted asphalt concrete and faulted portland cement concrete. Although milling by milling machines equipped with carbide-tipped teeth was least expensive, the textured surface produced was objectionable to many motorists. To improve surface texture, an increased number of teeth (3 times the normal amount) is proposed by the researchers.

Effects of Pavement Surface Texture Noise and Frictional Characteristics (HR-281)
This study compared the noise and frequency of noise on an existing deep transverse tine texture and on one modified by longitudinal diamond surface grinding. Although noise level changed very little, there was substantial reduction of the high frequency component of the traffic noise spectrum.

Retardation of Reflective Cracking Using Additive 5990 (HR-222)
Additive 5990's effectiveness in preventing reflective cracking in asphalt cement concrete placed over portland cement concrete is evaluated in this report. Varying percentages of the additive were tested at mix temperatures between 375-415 degrees F. It was concluded that the Additive 5990 did not prevent reflective cracking on this project.

Ammonium Phosphate/Fly Ash Road Base Construction (HR-294)
The objective of this project was to evaluate construction and service performance of ammonium phosphate fly ash treated base courses in a field trial. Factors such as pavement stress, environmental deterioration, construction methods, and quality control were evaluated.

Cracking and Seating PCC Pavement Prior to Resurfacing to Retard Reflective Cracking (HR-277)
The effects of various sized cracking patterns on reflective cracking and pavement structural rating was studied in 5 test sections. This report discusses the various cracking patterns and construction techniques used. Annual evaluations of the performance of the cracking and seating research are continuing.

About our new look

In an effort to reduce newsletter production cost and time, we have converted to a desktop publishing system for *Technology News* and other T2 publications. This issue was produced on Ventura Desktop Publisher software using an IBM-compatible Zenith system with Xerox monitor and HP LaserJet II printer.

Our thanks to Deborah Faul, ISU graduate student and T2 computer programmer, who has mastered the new technology and created our new look.

Technology News is published by the Local Transportation Information Center, ISU Extension--Business and Engineering, EES Building, Haber Road, Iowa State University, Ames, Iowa 50011. Program manager--Tom Maze; Coordinator-John Moody; Editor--Teddi Barron; Editorial assistant--Jim Flanigan; Desktop publishing-- Deborah Faul

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.

Reduce Liability-Join the CAUSE

by R.L. Carstens, Professor Emeritus of Civil Engineering

You can improve safety on your roads and streets, reduce your exposure to tort liability, and acknowledge the current fascination with acronyms by joining the CAUSE. Our acronym stands for Consistent And Uniform Signing Effort.

The absence of consistency and uniformity in the use of traffic signs has been the decisive factor in many judgements against highway agencies. Lack of a stop sign at an intersection led to a six-figure judgement against a county because the same route had stop control at some other intersections. Lack of a speed advisory plate at a turn on a route that had this type of sign at some other locations was cited as justification for a six-figure judgement against another county.

The accompanying photographs illustrate the problem that CAUSE can address. All of the photographs were taken in an area including about one-tenth of a county in central Iowa. There were 34 curves on granular-surfaced roads in this area. Shown in figure 1 is one of twelve curves that were preceded by warning signs. There were no warning signs on 22 curves such as the one shown in figure 2. All of the 13 turns in this area, such as the one shown in figure 3, had advance warning signs. However, shown in figure 4 is one of only three turns that also had speed advisory plates. This lack of consistency and uniformity in signing would almost surely result in a lawsuit and a judgement against this county if there were an accident on a curve without a warning sign or a turn without a speed advisory plate.

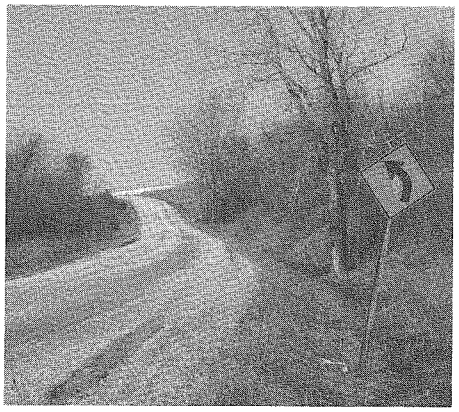


Figure 1

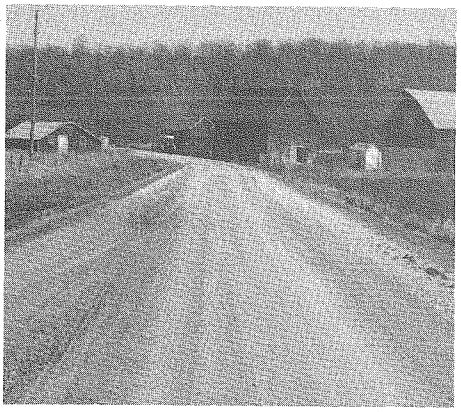


Figure 2

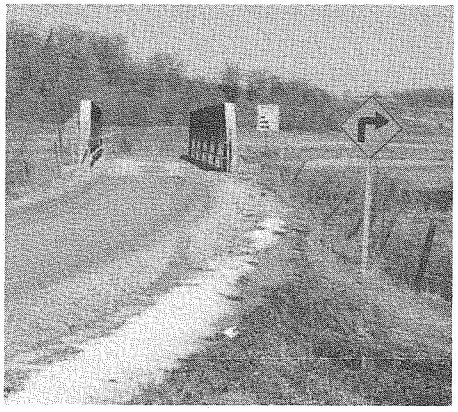


Figure 3

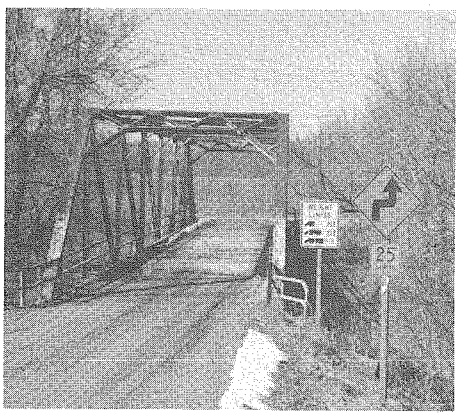


Figure 4

What alternatives are available to an engineer responsible for traffic control in a county? Consistency and uniformity could be achieved by removing some signs, but this would not improve safety and would lead to an intolerable situation in terms of liability. The existing condition cannot be left as it is. Adding signs at the 22 curves without advance warning and speed advisory plates at the ten turns lacking these signs might improve safety and surely would reduce the potential for liability exposure. An engineer choosing among these alternatives will want to join the CAUSE.

Historic road map available

In the early 1900s, Iowa's roads were little more than rutted paths, but their names conveyed an image of grandeur: The Great White Way, Imperial Highway, and King's Highway. Others were more to the point: Woodward-Ogden cutoff and Eldora State Center and Colfax Highway, for example.

These grandiose titles eventually gave way to the current federal system of numbering highways. However, to preserve a bit of Iowa's road history, the DOT has prepared a map showing the highways with the old names that were once officially recognized by the state.

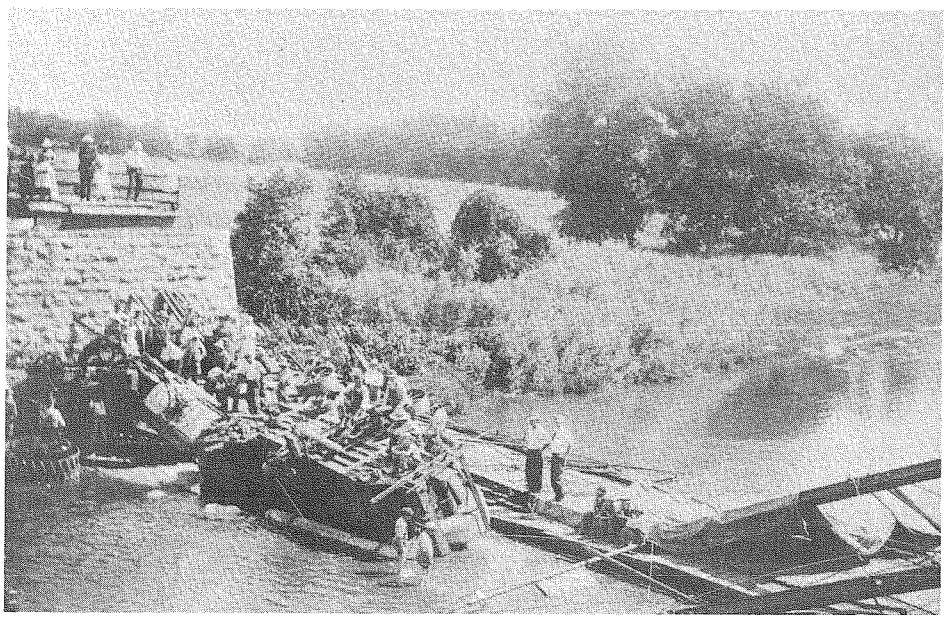
Measuring 2 feet by 3 feet, the historic map shows the original routes transposed over a background of the current Iowa Transportation Map. The map is available for $5 with a handling fee of $.60 for a folded copy or $2.20 for a flat copy. Mail orders should be addressed to Office of Accounting, ATTN: Cashier, Iowa DOT, 800 Lincoln Way, Ames, IA 50010.

With progress came problems

Although settlers arriving in Iowa encountered many problems, one of the more difficult was the frequent crossing of streams. Because wood was locally abundant and steel and iron had to be imported, most bridges were built with wood. This type of construction presented few problems for the wagons and buggies of that era.

With the arrival of heavy machinery, however, treacherous conditions were created, especially for farmers. Steam- and kerosene-powered tractors were mammoth. When these tractors pulled a heavy grain separator to the fields, the wood bridges would collapse under loads they simply could not handle.

By 1910, it was common to have three to four tractors crash through wood bridges each month during the summer. Quite frequently the driver was killed with escapes being few and miraculous. Replacing the wood bridges with steel bridges was a costly investment.



Preventing longitudinal cracking

Centerline longitudinal joints in concrete pavement seldom cause problems. But when they do, the problems are immediate, obvious and potentially expensive to repair.

The most common problem is random longitudinal cracking which wanders from two to six feet on either side of the joint, occasionally across the centerline, and occurs within a few days of placement. The source of these problems is not always apparent with the end result being that the contractor is assumed guilty of some unknown wrongdoing and forced to absorb the cost of repairs. In most cases the cracks are simply routed and sealed. But in some extreme cases the contractor has been forced to remove panels.

The fact of the matter is the contractor may not be at fault at all. There are several factors that apparently contribute to the problem. The mechanisms which cause this cracking are not well understood. Observations of this type of problem by ACPA staff engineers suggest possible preventative measures.

Most cracking cases of this type occur on projects which incorporate plastic parting strips in the centerline joint. Coring of several pavements at the parting strip in the cracked sections has revealed that the parting strip was not working in spite of proper installation. However, we cannot entirely blame the parting strip as the cause of the problem since it has worked very well.

Temperature ranges are a factor

Another common element in cracking of this type was late fall placement of the pavement. Temperature ranges from day to night were generally in excess of 25 degrees F. This suggests that curling or warping stresses induced by temperature differentials may be a contributing factor. It could be that the parting strip does not allow

Continued on next page.

Longitudinal cracking - con't
development of sufficient stress concentration at the bottom of the parting strip to induce control cracking.

There also appears the likelihood of problems developing on particularly strong subbases. Bituminous subbases and cement- treated subbases have demonstrated increased tendencies towards developing longitudinal cracks. Some of this cracking may be explained by the tendency of the concrete pavement to adhere to the subbase. This is particularly true in those situations where insufficient bond-breaker is provided between new "green" concrete and the relatively rigid subbase. Few problems of this type have been experienced on granular subbases.

Simple solution

So how do we substantially reduce the possibility of random longitudinal cracking problems of this type? The American Concrete Pavement Association recommends a fairly simple solution to the problem. Under typical weather conditions, longitudinal centerline joints should be sawed one third of the pavement depth within 24 hours when stabilized subbases are used under concrete pavements. Pavements placed wider than three lanes should be sawed as recommended above, regardless of the subbase type. The use of parting strips should be avoided, particularly in late fall paving.

Also, the use of a double application of wax-based curing compound can reduce the adhesion of the "green" concrete pavement to the subbase and minimize the warping stresses which contribute to cracking. The first coat is usually applied immediately after placement of the subbase and the second coat applied 24 hours prior to placing of the pavement.

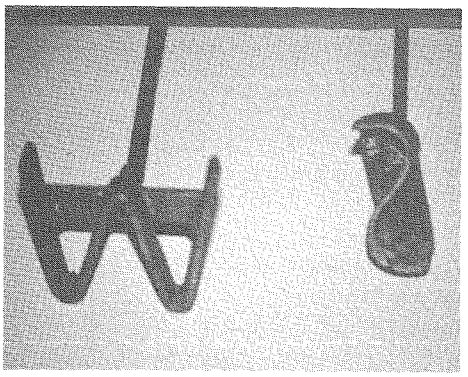
So, as you can see, the problem, although not well understood, is one of design and can largely be prevented if the proper measures are taken.

Reprinted from *ACPA's Concrete Pavement Progress*, July/August 1986.

tips from the field

Curb branding irons

According to the City of Clive Public Works Department, branding irons are not only for cattle. The Clive personnel have developed a set of branding irons for wet concrete curbs. The unique curb branding irons use initials such as S, MH, and W to permanantly mark the locations of water curb boxes, sewer stubs, water valves, or manholes. Using building measurements, the construction inspector brands the street side of the concrete after the curb is poured.



Branding irons can be used to mark locations on curbs.

When a worker needs to locate one of these outlets he can simply trace the location back into the yard along a straight line from the brand.

The idea reduces the number of calls made by plumbers looking for water and sewer stub-outs in new construction areas. Also, service department crews do not need to carry measurements pinpointing the location of these outlets. These brands serve as fairly permanent location markers.

For more information or specifications, contact John Moody, Local Transportation Information Center, EES Building, Haber Road, Iowa State University, Ames, Iowa, 50011-3074; phone (515) 294-8817.

Des Moines to host North American Snow Conference

The Marriott Hotel in Des Moines will be the site of APWA's 28th Annual North American Snow Conference, April 10-13. This major event will feature the most up-to-date information available on snowfighting subjects including plowing and removal, maintaining equipment, contract plowing, and sensible salting. Also scheduled: displays, banquet, and spouse program. For more information, contact Harold Smith, City Engineer of Des Moines, (515) 283-4920. Or return this form.

Please send me information on the North American Snow Conference

Name _____

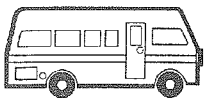
Agency or Firm _____

Address _____

City _____ State _____ Zip _____

Phone (___) _____

Mail to APWA 1313 E. 60th Street, Chicago, IL 60637



Bus crash-protection systems for the handicapped

The National Highway Traffic Safety Administration (NHTSA) conducted a state-of-the-art survey to determine the types of handicapped passenger crash-protection systems in use on school and transit buses. Based on the survey, the NHTSA issued the following guidelines for schools and transit bus operators serving the handicapped.

Transit bus categories
The desired characteristics of handicapped transportation equipment differ markedly for transit and school buses. Transit buses should be separated into two categories: those on fixed routes with a mix of non-handicapped and handicapped passengers and those that are specifically for the handicapped.

Driver assistance
School bus equipment lifts and wheelchair tiedowns should be operated with the bus driver's assistance in accordance with federal and state regulations. Transit buses serving only the handicapped should have user-operated wheelchair tiedowns, but the driver should provide assistance if needed. On fixed-route integrated transit buses, the boarding, maneuvering and securing of wheelchairs should be independent and efficient.

Bus modifications
Conventional bus floors provide adequate strength for attachment of fixtures and safety hardware. Step heights should be reduced from 12 in. to 8 in. to allow ambulatory handicapped persons to board the bus more easily. Step edges should not protrude. An integral step/lift fixture would resolve most loading difficulties. Door widths of 29 to 38 in. are recommended for wheelchair access. Within this range, doors should be as wide as allowable by the bus structure and other space considerations.

Seat and belt restraints
Side-facing seats are illegal in all school buses except those that transport handicapped school children. Some side-facing seats may be required for handicapped persons who would have difficulty getting into and out of front-facing seats. Belts or other restraints must be provided for side-facing handicapped passengers. Additional padding or barriers may be needed in front of the wheelchair-seating sections or side-facing seats. Seatbelts should be provided for ambulatory handicapped passengers on school buses and on demand-responsive buses for the handicapped and/or elderly. Supportive and/or padded restraints should be available for pupils unable to support themselves while the bus is in motion.

Aisles and exits
Aisles in buses that will carry wheelchairs must be at least 29 in. wide to permit easy entrance, exit, and access to emergency doors. Emergency exits on buses carrying wheelchair passengers should be at floor level and should be large enough to allow easy passage by a wheelchair.

Wheelchair securements
A fixture capable of holding an occupied wheelchair in position during front, side, rear, and rollover crashes should be securely attached to a sturdy structural part of the bus. One should be installed for each wheelchair. Securements on transit buses must be capable of being operated by the wheelchair occupant without an unusual amount of strength. Securements on school buses need not be operable by the wheelchair occupant. Wheelchair securements should attach to the strong parts of the wheelchair structure.

Wheelchair loading equipment
Wheelchair loading devices must be provided. For fixed-route transit buses the wheelchair loading device should be at the standard front doorway. School buses and special buses for the handicapped generally require an extra door with a lift or ramp on the side or rear. While a lift door on the rear requires the passenger to go out into the street, it is less dangerous in an accident because of its location behind the seating positions. Also, since the bus has just driven over the loading area, the area is sure to be clear. Side doors may be preferred because they can open onto sidewalks, but the stowed equipment inside the bus could be a hazard in a collision. A curb or uneven surface may also cause difficulties if the bus cannot be aligned with it. Ramp inclines must not exceed 10 percent if unassisted loading and unloading is intended. Therefore, ramps are generally impractical. A power lift with the following features is preferable:

- A pressure sensitive mechanism on the bottom of the platform should stop the lift upon contact with any surface or obstacle.
- A safety flap or other measure should prevent the wheelchair passenger's toes from being caught between the lift platform and the bus floor.
- It should have a minimum 400 pound capacity.
- It should have a manual backup system.
- It should have operating controls at three locations: the driver's seat, within reach of the person on the lift, and outside the bus adjacent to the lift.

Reprinted from *Arizona Roads* newsletter, April 1987.

for more information

Rating Unsurfaced Roads--A Field Manual for Measuring Maintenance Problems (Special Report 87-15, August 1987 by R.A. Eaton, S. Gerard, and D.W. Cate)
Unsurfaced roads (including gravel roads) must be analyzed and managed differently from paved roads. In this manual, the authors set up a method to help local highway agencies rate, analyze, and identify a maintenance management schedule for these unsurfaced roads.

Copies are available from U.S. Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire 03755.

Surface Design and Rehabilitation Guidelines for Low-Volume Roads
This FHWA manual is for owners, managers, and engineers involved with design, rehabilitation, and maintenance of surfacing for low-volume road networks. Considerations and constraints of the design process including drainage, geometrics, traffic, and materials are discussed. Design procedures for low- volume roads are given for both paved and aggregate surfaces. The manual also presents methods of maintaining and rehabilitating low-volume roads and discusses pavement management practices and the basics of pavement evaluation and performance.

Limited copies are available from the Local Transportation Information Center. Call John Moody at (515) 294-8817.

Concrete Admixtures and Asphalt Modifiers (Reprinted from *Roads and Bridges* magazine)
Those concerned with knowledge of concrete and asphalt mix design will be interested in the handy classification charts for concrete additives and asphalt modifiers. Product types and various attributes are listed including mix time, dosage, mix temperature, adding point, packaging, and price. Also included is an overview article from *Roads and Bridges* on the state-of-the-art of concrete admixtures.

Reprints are available from the Local Transportation Information Center. To receive your copy, call John Moody at (515) 294-8817.

Managing Transportation in Smaller Metro Areas (technical paper delivered at the 1987 International Public Works Congress and Equipment Show)
This paper discusses the problem of traffic congestion in small and medium urban areas and presents a range of traffic operational improvements to deal with the problem. It includes discussion of some selective transportation management measures successful in various cities. These include both traditional traffic operations improvement measures (signal timing, traffic control hardware, and traffic analysis tools) and resource management (partnerships and traffic management teams). The information presented will be of interest to transportation officials involved in traffic management in small and medium urban areas.

Reprints of the paper are available from the Local Transportation Information Center. Call John Moody at (515) 294- 8817.

Improving Guardrail Installations of Local Roads and Streets
Many existing guardrail systems have not kept up with advances in technology and do not perform as well as they could. Should a vehicle hit an improperly installed or maintained guardrail, causing damage or injury to vehicles or passengers, the jurisdiction responsible for maintaining those guardrails may incur unnecessary liability. This FHWA manual is an excellent guide to effective, low-cost methods of improving highway safety and reducing liability with updated guardrails.

Copies are available from the Local Transportation Information Center. To receive you copy, call John Moody at (515) 294-8817.

Protect yourself with photo records

When an accident occurs, one of the best protections a public agency may have is a photographic record of the situation. If properly recorded and preserved, this documentation might be invaluable in a tort liability suit.

The Iowa DOT has an excellent form that can be used to preserve photos with accompanying pertinent information. The 8 1/2 x 11- in. sheet of heavy paper includes strips of adhesive for attaching 3 photos and an adjacent form that facilitates recordkeeping. It is pre-punched for easy notebook filing.

Public agencies may order the forms in packages of 25 from the DOT. Request Photograghic Record of Accidents, form #370-810006. Available in packages of 25 for $1.51 plus postage. Minimum order $5.00. Contact Iowa DOT, Office Supplies Building, Ames, Iowa 50010; phone 515/239-1324.

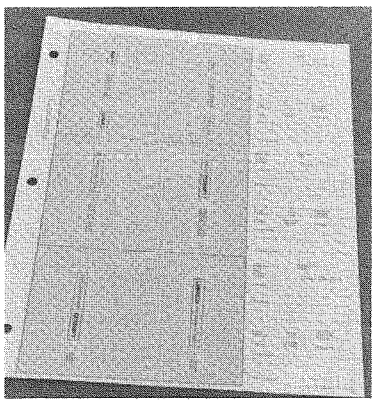


Photo record form provides accident documentation

conference 1 2 3 calendar

AGC Annual Convention
January 20-21
Des Moines

33rd Annual
Asphalt Paving Conference
January 26
Scheman Building, ISU
This conference provides up-to-date information pertinent to the applications of asphalt for pavements and parking lots. Sessions will focus on new methods and technology for design, construction, and maintenance of facilities. APWA-Iowa and the Asphalt Institute are cosponsors. Call Jim Cable at 515/294-2862 for more information

20th Annual DOT Conference
January 28-29
Scheman Building, ISU
This annual conference for Iowa DOT engineers and administrators offers informational updates on significant topics relating to highway, rail, air, and water transportation. For more information, call Jim Cable at 515/294-2862.

NACE Annual Meeting
February 3-6
Mobile, Alabama

Iowa Concrete Paving Association Annual Workshop
February 10-12
Des Moines

Iowa Limestone Producers Association Annual Meeting
February 17-18
Cedar Rapids

39th Annual
Better Concrete Conference
February 24
Scheman Building, ISU, Ames
This valuable conference features up-to-date facts about dynamic changes in concrete application. Cosponsors are the Iowa concrete industry, its contractors, suppliers, and associated service organizations. For more information, call Jim Cable at 515/294-2862.

Asphalt Materials and Mix Design Course
February 25
Scheman Building, ISU, Ames
For those who select materials and design and test asphaltic concrete mixes, this program will detail the technical and economic principles associated with asphalt mix design using Marshall testing methods. For more information, contact Tom Maze, 515/294-6777.

Iowa Ready Mixed Concrete Annual Meeting
March 6-7
Des Moines

35th Annual
APWA Public Works Conference
March 10-11
Scheman Building, ISU, Ames
Topics of current interest related to the technical and managerial aspects of public works will be discussed. Cosponsored by the APWA Iowa chapter. For more information, call Jim Cable at 515/294-2862.

Asphalt Paving Association of Iowa Annual Meeting
March 13-14
Des Moines

Iowa State Association of Counties School of Instruction
March 23-25
Des Moines

Technology News

Local Transportation
Information Center
EES Building, Haber Road
Iowa State University
Ames, Iowa 50011-3074

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