

# roads bridges transit technology news

Local Transportation Information Center  
Iowa State University Engineering Extension Service

February 1987

## Extend the life of bituminous seal coats

Summary of a report by James Valenta, transportation engineer for the City of Ames

Coating road cover aggregate with asphalt before applying it to streets may be a unique and possibly cheaper way to improve the uniformity and efficiency of resurfacing city streets, according to Ames' Public Works Department transportation engineer.

James J. Valenta, P.E., said that Ames, like most cities, renews part of its road surfaces each year with a layer of emulsified asphalt topped by an embedded crushed rock aggregate. This practice has long been accepted as a way to extend street life, especially in low-traffic areas that are often considered a second priority for repair.

However, in the 1986 Bituminous Seal Coat Project, the city precoated the aggregate with AC-10 asphalt in an attempt to improve embedding and reduce the need to overapply and waste the rock cover.

In his report, Valenta said, "The use of precoated aggregates in bituminous seal coat projects appears to hold promise as another tool that can be used by transportation officials as methods of cost cutting and project efficiencies are explored."

As a result of the project, Valenta recommended that bitumen application be continued according to Iowa DOT specifications, but aggregate should be precoated at the rate of 1 percent by weight. He also recommended that aggregate application to streets be lowered to 25 to 27 pounds per square yard instead of the current DOT rate of 30 pounds per square yard. The lower rate caused less tracking on roller tires and into private drives and homes, as did increasing street closure time to 24 hours. Some citizen complaints arose because the roads were closed longer, however.

During the 1986 project, Valenta said they first varied the amount of precoating applied to the aggregate to

see how well the aggregate embedded. The aggregate was coated with asphalt at the rate of either 1 percent,  $\frac{3}{4}$  percent, or  $\frac{1}{2}$  percent by weight.

The aggregate was applied to the streets with standard spreader equipment and then embedded with rollers. While it was necessary to use small quantities of water to keep the aggregate flowing through the spreader during the hottest days, Valenta said the water helped to retard binder cracking on long stretches.

After slow traffic for several days, the streets were swept and vacuumed to remove loose aggregate. The salvaged aggregate was weighed to assess the results of varying the binder rate, aggregate application rate and precoat rate.

The 1 percent precoat produced the highest application and salvage rates, but still had the highest

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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.

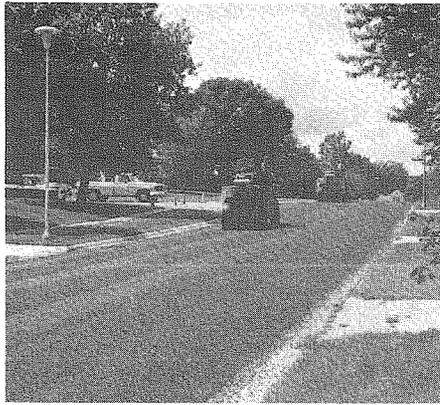
The T2 Center at Iowa State University is sponsored by the Iowa Department of Transportation and provides information and counsel to the municipalities and counties in Iowa. This newsletter is

designed to keep you informed about new publications, techniques, and training opportunities that may be helpful to you and your community. Individuals wishing to receive future copies of this newsletter at no cost may send their requests to: John Moody, Local Transportation Information Center, Engineering Extension, Iowa State University, Ames, Iowa 50011.

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.



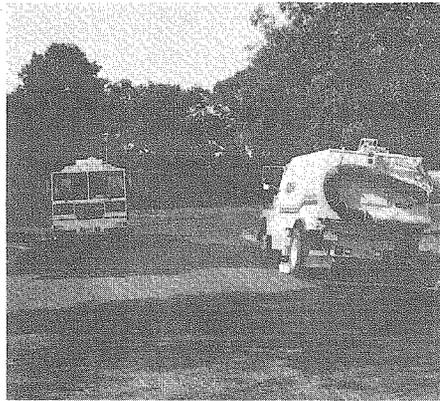
Precoated aggregate being piled after processing.



Rubber tire rollers embedding aggregate.



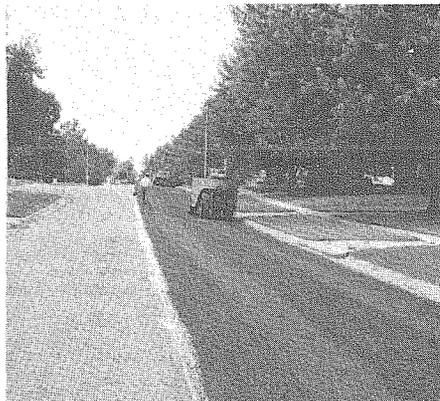
Binder being applied to seal surface cracks.



Vacuum sweepers recovering salvaged aggregate.



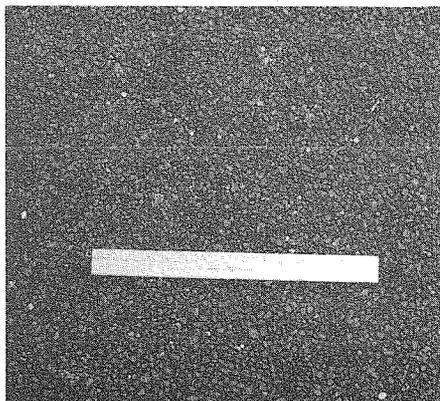
Application of felt paper at street terminus.



Comparison of pre-coated and uncoated surfaces.



Aggregate spreader discharging pre-coated aggregate.



Finished seal coat surface.

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amount of aggregate embedded. The salvage rate for 1 percent aggregate was high because it was applied before the aggregate application rate was lowered. Valenta speculated that the 1 percent aggregate yield would have been even better at a lower rate of aggregate application.

While some citizens complained that using pre-coated aggregates was noisier because more material was tracked along the street, Valenta said noise was reduced when less aggregate was applied. He added that there were none of the usual complaints about dust, especially with the 1 percent and 3/4 percent applications.

Bleeding or seeping of bitumen through the rock was also reduced because the pre-coated aggregate embedded more firmly, Valenta said. There was no need to apply sand to blot the excess bitumen, which is usually a problem during hot weather.

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*Technology News* is published by the Local Transportation Information Center Engineering Extension Service Haber Road Iowa State University Ames, Iowa 50011 1-800-262-8498 (in Iowa) Program Manager—Stan Ring Coordinator—John Moody Editor—Mary Holz Clause Editorial Assistant—Julie Anderson



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In Ames call  
294-8815



U.S. Department of Transportation

Federal Highway Administration



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The cost of applying precoated aggregate was 50.5 cents per square yard, while the year before uncoated aggregates were used at a cost of 51.5 cents per square yard, although the savings were mostly due to increased amounts of street resurfaced in 1986, said Valenta. He added that the City of Ames will monitor the performance of the new aggregate and probably continue its use in following years.

To receive the complete report, please write to:  
John Moody  
Valenta Article  
Local Transportation  
Information Center  
EES Building, Haber Road  
Iowa State University  
Ames, Iowa 50011-3075.

## A further test on tort liability wisdom

R. L. Carstens, professor of civil engineering

The three questions that follow frequently are asked in highway-related tort liability proceedings. Correct answers are given on page 5 of this issue.

1. An engineering study for determining the need for a traffic control device requires extensive written documentation.  
 True  False

2. Test runs using a ball-bank indicator are a sufficient basis to establish a recommended speed on a curve.  
 True  False

3. Although a semi-annual inspection of signs would be preferable, an annual inspection for condition of all signs in a jurisdiction should satisfy the sign manual requirement for a "suitable schedule for inspection."  
 True  False

## Is graffiti a problem?

The Navy's Civil Engineering Laboratory has developed some useful guidelines for removing graffiti from the surfaces of highway structures. They suggest that for the removal of products such as crayon, china markers, and ink, scrub with a stiff-bristle brush in a warm solution of trisodium phosphate (2 ounces per gallon) and water. Allow one to two minutes for the solvent to work then rinse with water.

To remove painted markings from unpainted surfaces requires scrubbing with a stiff brush using methylene chloride or a similar commercial remover. For removal of painted markings from painted surfaces, cautiously test one of three mixtures, methyl ethyl, ketone xylene, or an equal volume of the two to determine which is the most effective.

Reprinted from Saint Michael's College publication *Vermont Local Roads News*.

## Grain auger loads salt Radar and photography combine to catch speeders

Handling deicing salt has proven to be a problem to many street and highway maintenance personnel for many years. Naperville, Ill., is using an innovative method to move salt into a storage dome which street supervisors in Naperville claim has saved the city more than \$25,000. This method employs a standard agricultural grain auger.

For more details, see page 28 of the August issue of *Better Roads* magazine, or write to John Moody, Engineering Extension Service, Haber Road, Iowa State University, Ames, Iowa 50011, phone (515) 294-8818.

In Friendswood, Texas, police have added a "long eye of the law" to their traditional "long arm of the law."

According to a segment on National Public Radio, local police are using a new combination of Doppler radar, computer, and camera to clock and photograph speeders. The photographs give a frontal view of the vehicle, and clearly show the vehicle's license plate and occupants. The date, time, location and radar speed of the car are superimposed on the picture, furnishing police with a precise record of the violation.

Since the system was started up on May 4, 1986, about 1,900 traffic notices have been issued, said Barbara Gerlach, court clerk for Precinct 8 in Galveston County, in a telephone conversation. The photos are used to run a license plate check and locate the vehicle's registered owner. Letters are sent to the owners notifying them of the violation and asking them to identify the driver if they weren't behind the wheel. Then a letter is sent to the driver to exact a fine or to inquire whether they wish to set a court hearing date.

The letter informs the violator that the picture is in the court office, and they are allowed to see it at the courthouse. The photos are only sent out on special request, and the negatives are preserved as records for up to 50 years if the case goes to court.

The radar-camera unit is set up in a marked vehicle along the road, with the radar antenna set at a 20 degree angle across the traffic lane. The computer is set at a certain speed, usually 65 miles per hour, said Gerlach. An approaching car's left bumper enters the radar field first and triggers the system, and in about a microsecond the computer

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calculates the car's speed three times. By that time the car totally blocks the radar beam and the picture is taken.

In the NPR segment, James Woltz, justice of the peace for Precinct 8, said the photos provide an additional bit of knowledge if someone other than the registered owner is operating the vehicle. In some cases the car has been sold and the registration hasn't been changed. People are glad to be warned that the new owner hasn't changed the registration because they don't want to assume liability if an accident occurs.

Car leasing companies can notify leasers and ask them to take care of their fines, and owners are alerted if someone is using the vehicle without permission, like taking the company car to the beach on a Saturday. Woltz said the photos are not used if they don't turn out, but most of them "couldn't be any clearer if they were sitting still."

Gerlach said most people pay the fines because they "recognize they can't disprove the charge" with the combined evidence of Doppler radar, witnessing officer, and the picture. Violators also have the option of completing a defensive driving course, and only 50 claims have gone to safety court. Only four have been appealed to Galveston County Court, and they are still awaiting trial.

The system has been approved by Texas courts and the attorney general, and Gerlach said the photographs aren't a violation of privacy because they are taken on a public roadway through windows in open public view.

Gerlach, who handles the grudges people bring in about the photos, said that before the system received news coverage a lot of people were angry because they "had thought they'd gotten away with it." Now, the system is more widely accepted.

The system is in operation about eight hours a day, and one other city currently uses the special radar system. Gerlach said state troopers will probably adopt the system and "several other states will be going on line." Currently, Friendswood is leasing the unit from the man who brought it overseas and patented it, which allows them to use it without investing capital.

Dennis Ballantine, Ames chief of police, said he wouldn't see any legal limitations on the system if it was adopted in Iowa. However, the cost would be prohibitive. The system might be adopted if it reduced manpower costs, but currently an officer monitors the system. If it could be set up and secured without an operator, it "may be eventually adopted." The radar would be most valuable on the interstate.

Ballantine added that they already have a good conviction rate with traditional radar, and the pictures would have to ensure a similar rate for it to be feasible.

## Iowa Chapter of APWA honored

APWA's Iowa Chapter has won the 1986 Heritage Award and accompanying \$1,000 from APWA to support the chapter's historical program or a scholarship. The Iowa chapter was recognized for its historical project. Chapter Historian Ronald Kirchner and Historical Projects Committee Chair Arnold Chantland asked committee members to identify and publicize historically significant public works projects. Selected structures are fea-

tured in a historical photograph calendar accompanied by descriptions of each facility. Many of the photographs are unique, including a "squirrel cage" jail from 1885, a 1909 suspension footbridge, and a banquet held inside a storm sewer in 1903.

The calendar is only one aspect of the chapter's historical activities. A significant part of the chapter's historical program was the development

of a support group to assist in the creation of the new state historical building. Chapter officials contacted state engineering and construction organizations, and established an Engineering Support Committee to aid the Iowa Historical Museum Foundation. The committee's tasks include investigating potential support from the engineering community and assisting in collecting historical items representing Iowa engineering heritage.

## 1,400 watch ISU and Iowa DOT sponsored video

More than 1,400 people watched the video uplink "Hazardous Chemicals Risks Right-to-Know" workshop this past fall. The satellite video which was downlinked to 86 sites across Iowa was sponsored by the Iowa DOT, ISU Technology Transfer program, and other agencies and groups.

The two-hour program explained Iowa's Hazardous Chemicals Risks Right-to-Know law (*Iowa Code, Chapter 455D*), which requires employers to educate their employees about the risks of hazardous chemicals in the workplace.

ISU's Technology Transfer program has copies of the video and accompanying workbooks for loan. To request a copy, contact John Moody, EES Building, Haber Road, Iowa State University, Ames, Iowa 50011-3074, (515) 294-8818.

## Reference booklet of the twenty most used tables in highway maintenance

In 1972 the FHWA Office of Development (now the Office of Implementation) developed a training course "Managing Highway Maintenance." Included in the course material was

the booklet of the 20 most used tables in highway maintenance.

The booklet is in three parts:  
(1) areas and rates of application;  
(2) volumes and weights, and  
(3) conversion factors.

The tables included are:

### Table Number

| Table Number |   |
|--------------|---|
|              | <b>Part one: Areas and rates of application</b>                                 |
| 1            | Acreage—Right-of-way  |
| 2            | Acreage—Interchange   |
| 3            | Square yards of road surface for various road widths                            |
| 4            | Circles—Lineal and area measurements  |
| 5            | Lineal feet covered by 1,000-gallon tank  |
| 6            | Gallons of asphalt required per mile for various rates of application           |
| 7            | Tons of aggregate required per mile for various rates of application            |
|              | <b>Part two: Volumes and weights</b>  |
| 8            | Number of gallons in tanks of various sizes (based on percent of capacity)      |
| 9            | Storage capacity (in tons) of cone- or tent-shaped stockpiles of sand or gravel |
| 10           | Storage capacity (in tons) of cone- or tent-shaped stockpiles of crushed stone  |
| 11           | Loose and compacted weights of various materials                                |
| 12           | Pounds of aggregate required per square yard for various cubic yard weights     |
| 13           | Cubic yards of material required per 100 lineal feet for various loose depths   |
| 14           | Cubic yards of material required per foot for a typical culvert installation    |
| 15           | Number of board feet per lineal foot for various sizes of lumber                |
|              | <b>Part three: Conversion factors</b>   |
| 16           | Conversion factors—Length measurements  |
| 17           | Conversion factors—Area measurements  |
| 18           | Conversion factors—Volume measurements  |
| 19           | Conversion factors—Weights and other measurements                               |
| 20           | Conversion factors—Common fractions to decimal numbers                          |

For a copy, write Local Transportation Information Center or call (515) 294-8818.

## Highway Capacity Manual available

The Local Technology Transfer Center has a limited number of copies of the *Highway Capacity Manual*. A copy can be mailed to anyone who

submits a request with a check for \$40.00. The check should be made payable to Engineering Extension Service.

### Answers to tort liability questions

Attorneys, in asking the questions on page 3, are seeking to demonstrate by your answer that a highway agency was negligent.

Correct answers are as follows:

1. False. The required documentation for many traffic control devices is minimal. An example is the **soft shoulder** sign, the use of which would be based on a visual observation of shoulder conditions while construction or maintenance operations are in progress. At the other extreme is a speed limit sign for which the results of a spot-speed study and documentation of other relevant factors would be required.

2. False. Engineering judgment is required to properly interpret the results of a ball-bank test. Research at Iowa State University that used four different vehicles for such tests found a substantial variation, up to 5 degrees, depending upon the vehicle used. Judgment is required to select a speed that is comfortable and is safe under most surface conditions without complete reliance on a ball-bank indicator test.

3. True, but only if the inspections include a periodic surveillance of signs at night to determine their reflectivity. There also must be in effect a viable program for timely notification of signs that become damaged or are missing. The writer has observed recently that about 4 percent of all regulatory and warning signs on secondary roads have completely lost their reflectivity and an additional 10 percent are insufficiently reflective to meet the specification requirements for aged reflective sheeting (see Iowa DOT Standard Specifications, Article 4186.03.A.4).

# tips from the field

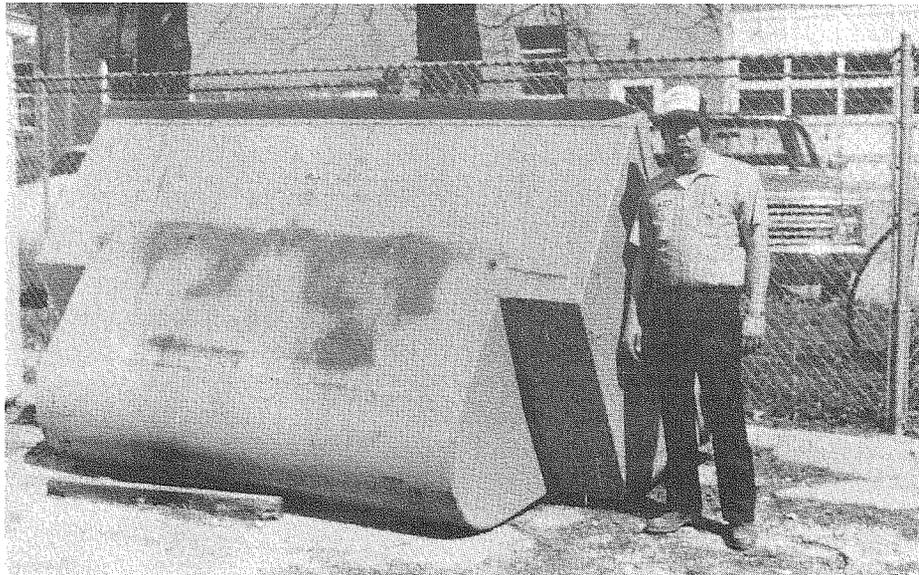
## Snow bucket

The City of Ankeny, Iowa, has developed a large snow bucket that hauls snow about two blocks to a dump site. The total snow removal (haul zone) is just a block long.

The use of this large bucket keeps trucks plowing elsewhere in the city, making this a loader operation. The bucket was made locally.

For more information call:  
Dennis Guillaume  
Acting Street Superintendent  
(515) 964-5500

or write him:  
2115 W. Walnut Street  
Ankeny, Iowa 50021



Large snow bucket that hauls snow to the dump site.

## Honey used as an antifreeze mixture for automobile radiators in 1925 was discouraged

Research conducted at Iowa State College in 1925 showed that solutions of honey and water are not suitable as an antifreeze mixture for automobile radiators.

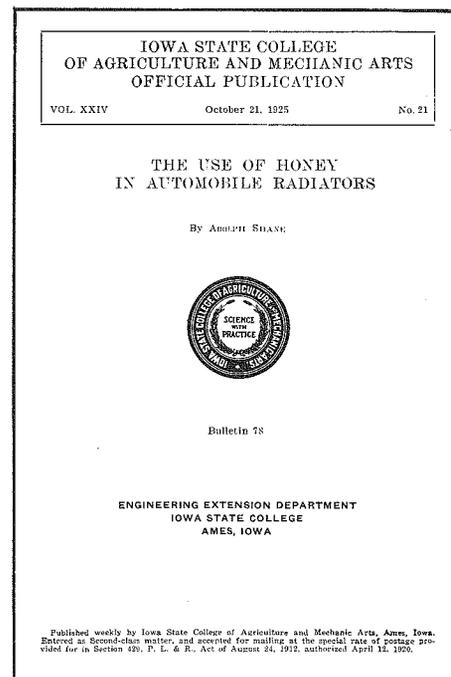
The tests and experiments showed that:

1. The freezing point of a 50 percent honey solution is only a few degrees below zero.
2. In cases of repeated overheating of the liquid, a caramel-like deposit is likely to form, reducing the efficiency of the circulating system.
3. Any leakage of the honey produces an undesirable sticky spread on the engine and garage floor.

4. One advantage of the honey solution is its higher than water boiling point. This permits the honey to remain as the water boils away.

5. Tests showed that a mixture of not less than 50 percent honey may be used without danger of damage by freezing. If freezing occurs in very cold weather, the resulting putty-like mass yields enough to prevent breaks in the circulating system.

Iowa State College Engineering Extension Department, Bulletin #21, October 21, 1925.



## Gustave Eiffel: The other man behind the great lady

The Fremont County engineer's office has donated a slide-tape program to the ISU Technology Transfer program. *Gustave Eiffel: The other man behind the great lady* was sponsored

by the the American Society of Civil Engineers and features Gustave Eiffel's early work on the Statue of Liberty.

The slide-tape which can be reserved through John Moody, (515) 294-8818, can be requested with either audible cues or silent. Please indicate preference when requesting it.

# County engineers recognized

More than 400 county engineers and other engineering professionals attended the 40th Annual County Engineers' Conference held December 2-4, 1986 at Iowa State University. Eight county engineers were recognized by their colleagues. The recipients are:

## Special Service Awards

• Keith Davis—Davis was a contract

engineer for the Iowa DOT. He retired in 1986.

• Dale Derby—Derby retired from the Iowa DOT after more than 35 years of work in bridge design.

## Past President Award

• William A. Moellering—The Fayette County engineer was honored for his contributions to the Iowa County Engineers' Association.

## 25 Year Service Award

- Bill Ellingrod—Palo Alto County engineer
- Gene Hardy—Dallas County engineer
- Milt Johnson—Wapello County engineer
- Lyle Laartz—Floyd County engineer
- Tom Nelson—Taylor County engineer



## conference 1 2 3 calendar

*A Positive Approach to Defending Municipalities.* 117-page manual written by Jay S. Judge of the law firm of Judge and Knight, LTD., Oak Park Ridge, Illinois.

The firm defends and tries cases throughout the United States. Members of the firm consult with, advise, and/or work with attorneys doing municipality defense work.

*Errata Sheet for A Policy on Geometric Design of Highways and Streets, 1984.*

The Local Transportation Information Center has received seven pages of errors that have been reported in the "green book." Individuals using the

"green book" for reference should have these changes. Call John Moody at (515) 294-8818 if you would like to receive a copy.

*Culvert Inspection Manual.* The FHWA recently published this supplement to the Bridge Inspector's Training Manual. It has been prepared in accordance with the procedures and rating system in the Bridge Manual. As many small bridges are being replaced with multiple barrel, culverts, box culverts, or long span culverts, this publication will be helpful.

To order contact John Hooks at 202/285-2362.

**NHI Road Surface Management Gateway Center, Ames**  
January 27-29

This three-day workshop will provide county and city engineers with sound practical information on road surface management. Because road and street surfaces represent the largest single share of the transportation investment, it is important that these decision makers know the most cost effective ways to manage road surfaces.

**19th Iowa Annual DOT Transportation Conference**  
Starlite Village, Ames  
January 29-30

**NACE Annual Meeting**  
Orlando, Florida  
February 4-7

**AC Mix Design Workshop**  
Town Engineering Building, Ames  
February 5

**Soils and Foundations Workshop**  
Starlite Village, Ames  
February 10  
The focus of this one-day workshop is for transportation providers who are involved in and responsible for the monitoring, design, and construction of street and highway projects. Topics include: site investigation, centerline cuts and embankments, retaining walls, structure foundations-spread footings,

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## New publications available

*Manual on Uniform Traffic Control Devices*

Revision #4 dated March 1986. All those who have the MUTCD should order this revision from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

*Countermeasures for Sign Vandalism*  
This 1986 publication presents guidelines for planning, implementing, and evaluating antivandalism programs. Copies may be obtained

by contacting Mr. Knox Adams, RD and T Publications, FHWA, 6300 Georgetown Pike, McLean, VA 22101.

*Hydraulic Design of Highway Culverts*

Hydraulic Design Series No. 5, September 1985 FHWA Report-IP-85-15

A limited number of this publication is available from the Local Transportation Information Center by calling John Moody, (515) 294-8818.

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piles, drilled shafts, materials sites, and checklists and guidelines.

**12th Annual ASCE  
Geotechnical Conference**

Starlite Village, Ames  
February 11

Current practices and the latest techniques in design by notable speakers in the geotechnical field. This annual conference offers a valuable opportunity for an exchange of ideas among design professionals, contractors, owners, and developers working with subsurface investigations. The American Society of Civil Engineers-Iowa Section is cosponsor.

**Iowa Limestone Producers Workshop**

Des Moines  
February 11-13

**APWA Construction  
Inspectors Workshop**

Storm Lake  
February 12

Experts in the field will provide extensive detail on the primary aspects of construction common in both municipal and rural public works systems. This workshop is intended for construction inspectors who are new to the field and for those who want to update their knowledge of current procedures. The workshop is cosponsored by the American Public Works Association-Iowa Chapter.

**Multiplan spreadsheet workshops**

Scheman Continuing Education  
Building, Ames  
February 13, 20  
March 10

This workshop is intended to demonstrate applications of the Multiplan spreadsheets developed under HR-284 for both highway engineering and hydraulic engineering. It will also demonstrate applications of each type of spreadsheet and permit participants to apply the spreadsheets to integrated engineering highway problems.

**32nd Annual Asphalt  
Paving Conference**

Scheman Continuing Education  
Building, Ames  
February 26

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. The Asphalt Paving Association of Iowa and the Asphalt Institute cosponsor this annual event.

**ACI Technicians School**

Town Engineering Building, Ames  
March 9-10

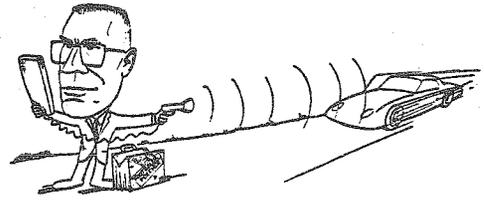
**34th Annual APWA  
Public Works Conference**

March 12-13  
Scheman Continuing Education  
Building, Ames

Topics of current interest related to the technical and managerial aspects of public works will be discussed by consultants, suppliers, manufacturers, and public works officials. The annual event is cosponsored by the American Public Works Association-Iowa Chapter.

**Carstens retires**

Robert "Sam" Carstens, ISU professor of civil engineering and frequent contributor to *Technology News* retired December 18, 1986. For the past 22 years at Iowa State, he has been conducting research and teaching classroom and extension courses.



Cartoon of Carstens by Paul De Jong.

**And justice for all**

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