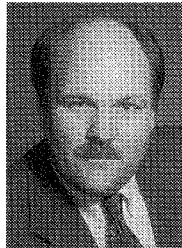


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|---|---|----|---|
| 2 | Iowa in national pavement markings study | 8 | County engineers attend TRB conference |
| 3 | Measuring retroreflectivity | 8 | ITC helps TRB celebrate 75 years |
| 4 | Iowa DOT, Engineering Division | 9 | Prewetting salt with brine improves deicing |
| 6 | Microtechnology: GIS/GPS part two | 9 | Finland solves brine maker filter problems |
| 7 | ITC welcomes GIS specialist | 10 | Tip from the field: lithium grease helps paint guns |
| 7 | APWA/OSU teleconference on metrication | 11 | Library materials |
| 8 | Call for papers: transportation conference at ISU | 12 | Conference calendar |

A word from the director

By Tom Maze



SINCE 1983, Iowa State University has provided Iowa's local governmental agencies with quality transportation technology transfer services through this center. Most local agencies are familiar with our programs, recognize our newsletter, and know the individuals who produce the programs—Stan Ring, Ed Bigelow, Duane Smith, Marcia Brink, Mike Bugenhagen, and Jan Graham.

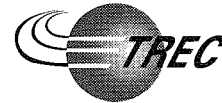
During the last twelve years, however, our center has undergone several identity changes. At first, as the Local Transportation Information Center, we were entirely an extension organization. In 1990, as our mission was expanding to include a significant research element, we became the Iowa Transportation Center. That same year (and to make matters even more confusing) we assumed management of a large research and education grant which was also called a center—the Midwest Transportation Center.

Since 1990, we have significantly broadened our programs in transportation research and transportation education (both outreach education and formal education). We now have broad programs with full-time professional managers. Duane Smith, our associate director for outreach, is an example of the new professional program management. We have also expanded our projects and programs in Iowa and in several other states in the Midwest and beyond.

On October 1, 1995, the Midwest Transportation Center program will move to the University of Nebraska at Lincoln, where it will be known as the Mid-America Transportation Center. As a result, we are again in transition as we taper down a very large and significant program.

For a number of reasons, then, we will soon change the name of the center to the Transportation Research and Education Center—otherwise known as TREC. The Iowa Board of Regents will formally consider the name change in October. The new name is more reflective of our mission and our national and international projects and

programs. Our new TREC logo retains the familiar three lines signifying the center's three mission areas—outreach, education, and research.



**Transportation Research
and Education Center**

In addition to changing our name, we are also moving to a new off-campus location in the Iowa State University Research Park later this fall. The new offices, within a few hundred meters of our present location, are at 2625 North Loop Drive, Suite 2100, Ames, Iowa 50010. The telephone number will remain the same: 515-294-8103.

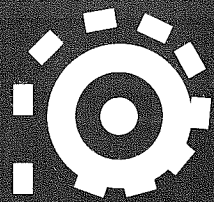
The new offices will approximately double the center's floor space and expand the area devoted to the LTAP library and the GIS support facility. We should be ready to show visitors around our new location in December, so please stop by.

As you have probably already noticed, Marcia Brink, our publications editor, has given *Technology News* a facelift. The new format is intended to improve the readability of the newsletter, while the articles continue to provide the same valuable information our readers have grown to expect.



**Time for a
change: With
this issue,
*Technology
News* has its
second facelift
since the first
issue in 1983.**

If you have any comments regarding the center's programs or its new image, or if you have suggestions about how we might improve our services, please contact us. You can reach any of the staff or me at 515-294-8103. Or you can reach us by e-mail: Marcia x1brink@iastate.edu
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TECHNOLOGY NEWS
roads / bridges / transit
Transportation technology transfer for Iowa's local governments

The preparation of this newsletter was financed through the Local Technical Assistance Program (LTAP). LTAP is a nationwide effort financed jointly in Iowa by the Federal Highway Administration and the Iowa Department 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.

Subscriptions to **TECHNOLOGY NEWS** are free, and we welcome your comments, questions, and suggestions. To subscribe, or to obtain permission to reprint articles, contact the editor at the address below.

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TECHNOLOGY NEWS
Nameplate and graphic elements were designed by Jennifer J. Reed.

Iowa participates in national pavement markings study

Three Iowa counties and the Iowa DOT are part of a nationwide study that will provide the field data for establishing minimum retroreflectivity standards for pavement markings.



THE EFFECTIVENESS of pavement markings at night depends on their visibility, which in turn depends on their retroreflectivity. Part III of the Manual on Uniform Traffic Control Devices (MUTCD) (1988) states that markings on all public roadways where night visibility is essential must be reflectorized, except where there is adequate ambient lighting, but the manual does not give minimum levels of retroreflectivity.

This general directive was superseded in 1992 when the U.S. Department of Transportation came under federal mandate to establish minimum retroreflectivity standards for signs and pavement markings. Retroreflectivity standards for signs and pavement markings should be included in the next revision of the MUTCD, due in 1998.

In the Federal Highway Administration's *Roadway Delineation Practices Handbook*, retroreflectivity is defined as "the phenomenon of light rays striking a surface and being redirected back to the source of light." The goal for retroreflectorized pavement markings is to redirect light back toward vehicles' headlights (that is, generally toward the driver).

Pavement markings are usually retroreflectorized by dropping or spraying glass beads onto or into marking materials as roadways are being painted. The beads must be transparent and round to act like lenses. Light enters a bead, is refracted or focused down through the bead, and then is reflected from the paint-coated back surface of the bead back toward the path of entry.

Good retroreflection, according to the FHWA's *Roadway Delineation Practices Handbook*, depends on three factors: (1) the quality and quantity of beads, (2) the quality and quantity of high index pigment in the pavement marking's binder, and (3) the correct height of embedment of the beads in the binder. Of course, the retroreflectivity of new pavement markings changes as weather, traffic, and roadway maintenance activities affect these factors.

And just what is "good" retroreflection, anyway? Having initially proposed a minimum level some-

where between 80 and 120 millicandelas per square meter per lux, the FHWA is studying this question from two perspectives:

First, using an enhanced visibility-based model, the FHWA is researching the pavement marking retroreflectivity required by drivers to see pavement markings at distances that provide adequate safety for a variety of road conditions and driving situations. Second, using hand-held retroreflectometers, the FHWA is conducting field tests to measure the retroreflectivity of existing pavement markings in 33 jurisdictions around the country. Together, the field tests and research will provide the basis for the FHWA's recommended standards for pavement marking retroreflectivity.

The FHWA is sponsoring research by Dr. Helmut Zwahlen, professor of industrial and systems engineering at Ohio University, on his enhanced road markings visibility model. A major assumption of the research is that there is a positive correlation between the maximum visibility of pavement markings and driving ease, comfort, efficiency, and safety. Dr. Zwahlen's model (CARVE, Computer Aided Roadmarking Visibility Evaluator) measures the contrast between pavement marking luminance and pavement luminance, taking into consideration such factors as headlamp beam pattern and mounting height; driver eye height; pavement marking placement, color, and width; and type of pavement (portland cement concrete or asphalt). The model is being enhanced to output not only maximum distances at which pavement markings can be seen under various circumstances but also measurements of retroreflectivity required to provide given visibility distances.

Current FHWA plans are to generate data from the model in late 1995 and to conduct sensitivity analyses to determine the importance of various factors by early 1996. This will allow the FHWA to develop a framework for minimum requirements by mid 1996.

The Minnesota Department of Transportation (MnDOT) is completing the field tests started by Tonya, Inc. in fall 1994. In spring 1995 MnDOT personnel spent several weeks taking follow-up readings in several jurisdictions, including a week in Iowa with the DOT and Black Hawk, Linn, and

... continued on page 3

MARKINGS. . . continued from page 2

Clinton counties, where waterborne and epoxy markings were tested on rural and urban roadways. All field tests in more than 20 states will be completed by spring 1996, according to Jim Carlson, transportation planner at MnDOT.

The field tests, says Carlson, will not only be important for developing national retroreflectivity standards, but will also provide data for MnDOT's developing pavement markings management system.

"We're in a learning curve with the measurement of the retroreflectivity of pavement markings," says Carlson. "We're learning how markings perform over time and also what testing equipment works best and is most reliable."

The field tests serve an additional purpose, according to Mike Griffith, a researcher at the Turner-Fairbank Highway Research Center in Washington, D.C. The field tests provide the FHWA with an estimate of the economic impact of retroreflectivity standards. By providing an overview of the current state of the nation's pavement markings, the field tests allow the FHWA to estimate how many thousands of miles will have to be re-stripped given various proposed standards.

"The FHWA wants to set standards that meet drivers' needs," says Griffith, "without imposing extreme economic hardships on state and local governments." By combining the research perspective with the practical field perspective, the FHWA hopes to strike a workable balance for pavement marking retroreflectivity standards.

When all data have been collected from the field tests and Dr. Zwahlen's study, rule-making procedures will begin. According to Ernest Huckaby at the FHWA's Office of Highway Safety in Washington, D.C., a final report should be completed and the proposed rule for retroreflectivity standards for pavement markings published in the Federal Register by late 1996. The public will then have three to six months to comment on the proposed standards.

Like Dennis Edgar, registered assistant in Black Hawk County, Iowa, where field tests have been completed, you may be eager to have some input into the final standards. *Technology News* will let you know when the proposed rules for pavement retroreflectivity standards have been published in the *Federal Register*.

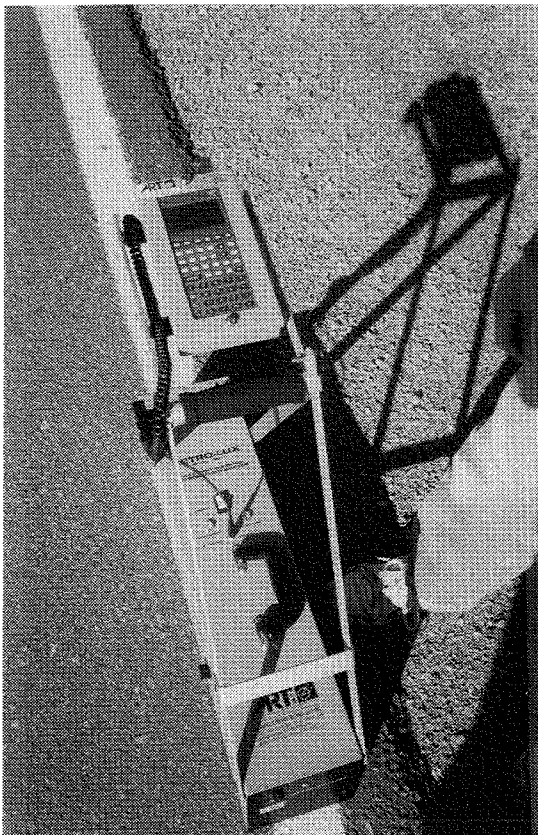
For more information about issues involved in national standards for pavement marking retroreflectivity, contact Steve Gent, traffic engineer at the Iowa DOT, 515-239-1129.

Measuring retroreflectivity

RECENT IMPROVEMENTS in technology have resulted in better equipment for measuring the retroreflectivity of pavement markings. The latest instruments use an optical geometry that more closely resembles that of a typical driver: the 30-meter observation distance geometry.

The 30-meter geometry was selected under the Federal Highway Administration's Test and Evaluation

. . . continued on page 4



This hand-held Retrolux was used to measure the retroreflectivity of pavement markings in Clinton County in October 1994.

LTAP Advisory Committee

The people listed below help guide and direct the policies and activities of the Iowa Transportation Center's Local Technical Assistance Program (LTAP).

The committee meets at least annually. Representatives of rural and urban agencies and individuals concerned with the transfer of transportation technology in Iowa are welcome to attend advisory committee meetings.

Contact any of the advisory committee members to comment, make suggestions, or ask questions about any aspect of LTAP.

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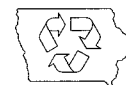
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 Iowa Department
of Transportation

 Iowa Transportation Center

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Iowa DOT reorganization: spotlight on Engineering Division



WITH REORGANIZATION, the new Engineering Division combines facilitating research management responsibilities with functions from the former Bureau of Transportation Safety as well as with most traffic engineering functions from the former Office of Maintenance.

According to Ian MacGillivray, director of the Engineering Division, the division's name can be misleading. Some people outside the department assume that all the department's engineering work is done in the Engineering Division, but this is not the case. The division is concerned more with engineering processes and engineering development activities, along with both traffic and safety engineering, than with design and construction engineering.

"In effect, we're often like an in-house advisor or assistant to the staff who carry out the actual engineering work," says MacGillivray.

According to MacGillivray, the Engineering Division works in partnership with other divisions on

their projects. The other divisions usually take over the actual production or implementation of their projects. One reason the Engineering Division works closely with the other divisions is because safety, a primary responsibility of the division, is extremely important and is a factor in much of what the department does.

"Our closest partner in the department is probably the Maintenance Division," says MacGillivray. "In some fashion, we're like a traffic engineering consultant for the Maintenance Division." The Engineering Division assists in developing plans, like a pavement markings plan, and the Maintenance Division implements the plan.

Local agencies will come in contact with the Engineering Division regarding issues involving transportation safety, traffic engineering, and research. For example, if officials are applying for state funding for a safety project on a public road (city, state,

... continued on page 5

MEASURING ... continued from page 3

Project 29, "Retroreflectivity," because it conforms to the normal passenger automobile's viewing distance at night. It is likely to be adopted worldwide and has already been adopted by the European Committee on Normalization.

The only hand-held retroreflectometer currently available with 30-meter geometry is the Retrolux, built by Advanced Retro Technology, Inc. Other manufacturers, like MiroLux and Potters, will likely offer retroreflectometers with this geometry in the near future.

Jim Hogan, mobility and traffic operations engineer at the Iowa Division of the FHWA, has a Retrolux available for loan to local jurisdictions. Hogan is willing to work with local shops on the use of the device, particularly if several shops join together for a regional training session.

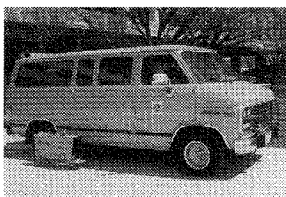
A mobile retroreflectometer—the Laserlux system, built by Roadware Corporation—is a passenger van modified with a laser system that reads the retroreflectivity of pavement markings in daylight conditions at speeds up to 88 km/hr.

The Laserlux system promises significant advantages over hand-held meters: It can collect an enormous amount of data in a short time; personnel are not exposed to the traffic hazards associated with taking readings with a hand-held device; it reports average readings with standard deviation for any determined length of roadway; and it removes the potential human biases in data collection.

The FHWA is using the Laserlux system in a five-year evaluation of all-weather pavement markings in 19 states. The Iowa DOT is participating in this study.

Currently the FHWA has one Laserlux system with five more on order, and the Iowa DOT has requested the use of one of them for testing. Because of the \$100,000 price tag for the Laserlux system, hand-held units like the Retrolux will likely be widely used in Iowa.

For more information about these retroreflectometers, contact Jim Hogan at the FHWA, 515-233-7305. ■



The Laserlux van was demonstrated at the Iowa Transportation Center's Pavement Markings Conference in April 1995.

or county), they will be in contact with the Engineering Division.

If a city engineer or public works director wishes to improve the efficiency of a major city street, which also happens to be an existing state highway, by adding a traffic signal or widening an intersection, the proposal will go through the regional transportation center and then to the Engineering Division.

Also, officials who are interested in accident data on the road system will contact the Engineering Division. The division will provide the officials with the appropriate information to help them evaluate the safety of their particular roadways.

As for research, the Engineering Division primarily coordinates the department's research management plan. The only detailed research conducted by the division itself is in the areas of traffic and safety and related technology transfer.

"We are to help facilitate others in doing their research. We don't do it for them, and we don't get

in their way while they're doing it. Our job is to provide assistance," says MacGillivray.

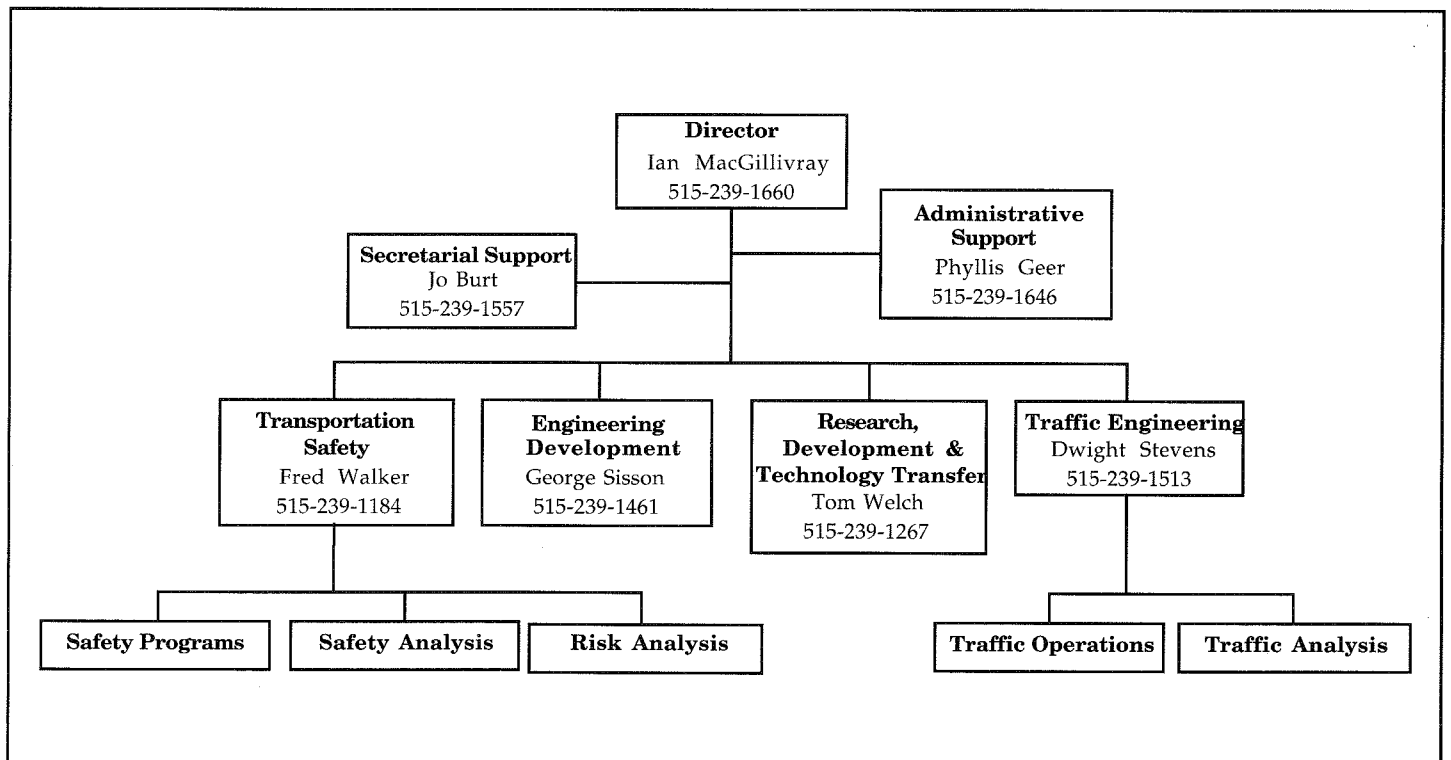
The division also deals with operational improvements. For example, if an intersection is congested because a traffic signal is not managing traffic adequately, the division decides if it would be feasible to build a special turning lane to help traffic move more smoothly through the intersection.

Local officials who need to work with the Iowa DOT generally do so through the regional transportation centers. The Engineering Division does not have representatives at the transportation centers but works closely with the divisions that do.

For more information about safety, contact Fred Walker, 515-239-1184; about traffic engineering, contact Dwight Stevens, 515-239-1513; about research, development, and technology transfer, contact Tom Welch, 515-239-1267; and about engineering development, contact George Sisson, 515-239-1461.

"We're like an in-house advisor to the staff who carry out the actual engineering work."

-Ian MacGillivray



The new Engineering Division at the Iowa Department of Transportation combines interdepartmental research management with safety and traffic engineering functions.



GIS/GPS implementation issues: part two

This two-part series provides an initial review of GIS/GPS implementation issues. It is adapted from an article in the May 1995 issue of *Coordinated GIS*, the newsletter of the Iowa Geographic Information Council.

By Reg Souleyrette, Associate Director of Research

EVERY DAY more agencies, companies, and individuals are using or are considering using geographic information system (GIS) and global positioning system (GPS) technologies. This article is an informal discussion of some implementation issues that may interest Iowans who are facing these decisions. It is by no means comprehensive and, of course, the opinions are my own.

In part one of this series (August 1995), GIS and GPS were defined and GIS implementation issues were discussed briefly. GIS was defined as a collection of software, hardware, data, trained personnel, and repeatable procedures used to store, manage, analyze, and graphically present geographically referenced data. GIS is used to support decision making. GPS was defined as a collection of components (satellites, ground stations, mobile receivers, and base stations) that together provide a relatively low-cost, accessible method for capturing geographic coordinate information for points.

In part two, GPS implementation issues and data collection/capture issues are discussed briefly.

GPS Issues

GPS technology is based on signals from 24 satellites maintained by the U.S. Department of Defense. The satellites are continuously provided with their "exact" location from DOD base tracking stations. Each satellite continuously broadcasts its position and very accurate current time. The positions and time can be received by portable receivers that can be purchased by the public. Given the location of a satellite and the time it takes to receive its signal, the receivers calculate the distance from the satellite.

Distance from one satellite places the receiver anywhere on a sphere. Information from two satellites places the receiver on a circle (the intersection of two spheres). A third distance allows calculation of

two points of intersection (one being out in space somewhere and obviously wrong). A fourth reading allows the GPS receiver to correct for errors introduced by its relatively inaccurate clock. Other errors are selective availability (SA, which is sometimes introduced by the DOD intentionally to keep potential enemies from using GPS effectively in military strikes) and atmosphere-induced errors.

Type and cost of available hardware. Several types of GPS receivers are currently available. Low-end GPS receivers can be purchased for a few hundred dollars and can locate the user within 100 meters, 95 percent of the time (2DRMS). More expensive units costing up to \$10,000 or more can store readings and interface with a computer (or even contain a computer) for data dumps or GIS input.

To eliminate most of the errors, differential corrections from a local base station GPS can be applied either in real time or via post-processing. Differential stations can be purchased that provide corrections useful up to about 100 km from the base station. Differential corrections can also be obtained commercially via FM sideband or satellite transmission. Or the corrections may be obtained from government sources in limited areas (e.g., along navigable waterways, the Coast Guard DGPS stations may be used). Differential GPS (DGPS) can provide accuracy better than one meter, 95 percent of the time.

Even more sophisticated units are available for surveying. These units use a different processing technique to obtain relative errors better than a few centimeters.

Time and effort required to collect data. GPS coordinates may be obtained by most receivers every second. For dynamic applications (e.g., the receiver is moving), this provides distances between measurements that are proportional to speed (e.g., at 60 mph you get a readout about every 100 feet). Survey-quality GPS requires several minutes to lock on to a single location, but progress is being made by some GPS manufacturers in developing a unit that will collect survey quality readings in a dynamic mode. For two good references on GPS technology, see Trimble Navigation Limited's *GPS - A Guide to the Next Utility* and *Differential GPS Explained*.

"This article is a first attempt at cataloging a number of issues facing anyone interested in accessing or using GIS and GPS technologies."

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Accuracy. We have briefly mentioned accuracy, the topic of greatest interest to many prospective users of GPS. Hand-held, single channel units can get at least 100-meter accuracy when SA is being used by the DOD. But in many cases, the accuracy is much better (20 meters or so.) Rumor has it that the DOD isn't using SA much these days. Of course, that can change any minute.

Most of the 20-meter remaining error is caused by ionospheric distortions. SA and ionospheric errors can be mostly eliminated by the use of DGPS. Errors remaining with DGPS (less than a meter or so) are mostly clock errors.

Survey-quality units require a good reference point to start with, and the USGS, in cooperation with many state and local agencies, is developing a national system of these points called the High Accuracy Referencing Network (HARN). State and local involvement allows the proposed grid of 100 meters to be densified, and the Iowa DOT is leading a coordinated effort for grid densification.

Data collection

There are many sources of existing GIS data, both in the public and private sector. Universities have also developed a large amount of data and applica-

tions. The Iowa Geographic Information Council was formed, in part, to address the need for more effective communication and data sharing among these organizations in Iowa.

The Census Bureau (e.g., TIGER), USGS (e.g., DLGs, DEMs) and the Bureau of Transportation Statistics (e.g., national highway network) all provide free or low-cost GIS or GIS-able data sets. Many of these data sets are now available over the Internet via ftp (file transfer protocol) or the World-Wide Web (WWW). There are also several private providers in the business (ETAK comes to mind for accurate street networks).

Summary

This article is a first attempt at cataloging a number of issues facing anyone interested in accessing or using GIS and GPS technologies. Brief definitions of each technology are also given. Several key issues may have been omitted altogether, but it is hoped that the article will provided a basis of understanding and stimulate discussion and further articles.

Submit corrections and/or suggestions to Reg Souleyrette, 515-294-8103; e-mail: reg@iastate.edu.

“Many . . . data sets are now available over the Internet via ftp (file transfer protocol) or the World-Wide Web.”

Metrication tele-conference provided by APWA and OSU

FEDERALLY FUNDED construction contracts must go metric by September 30, 1996. This transition has a far-reaching effect on the highway construction industry.

On October 18, 1995, the American Public Works Association and Oklahoma State University will team up to provide a national teleconference, “Transitioning to Metric.”

In addition to providing information from a panel of experts, this teleconference will offer a lively forum for thousands of people at nationwide sites to share ideas and practical suggestions.

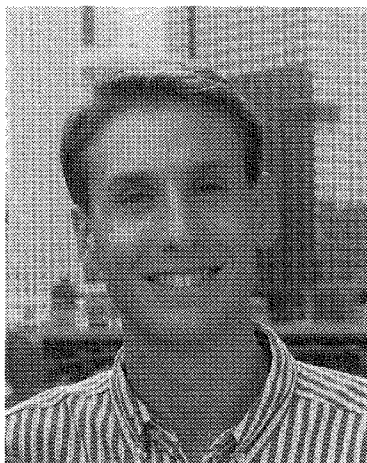
For more information about registration and downlink sites, contact Sara Cerwin at the APWA, 816-472-6100.

ITC welcomes GIS specialist

ZACHARY HANS is the new GIS specialist at the ITC. Hans is a familiar face at the center, as he worked here while getting a master's degree in civil engineering with an emphasis in transportation engineering at Iowa State University.

Hans's main responsibilities include conducting research in geographic information systems for transportation (GIS-T) and serving as the hands-on manager of the center's GIS-T support facility.

Some of Hans's current activities include statewide transportation modeling, supporting the implementation of GIS at the Iowa Department of Transportation, and supporting the statewide pavement management system.



Zachary Hans

Call for papers

A transportation conference to celebrate the 75th anniversary of the Transportation Research Board will be held in May 1996 at ISU, where the TRB was conceived.

IN NOVEMBER 1920, Anston Marston, dean of the College of Engineering at Iowa State College, chaired the first executive committee meeting of what was to become the Highway Research Board—later the Transportation Research Board (TRB). Marston and several of his colleagues at the college and the Iowa State Highway Commission (now the Iowa Department of

... continued on page 10



Anston Marston, first dean of engineering at Iowa State College, envisioned a national program of transportation research. He chaired the first executive committee meeting of the Transportation Research Board in November 1920.

Iowa county engineers attend TRB's annual conference

THE TRANSPORTATION RESEARCH BOARD is the oldest and most influential private transportation research organization in the country and, as part of the National Research Council, has a unique relationship with the federal government, state governments, transportation-related associations, and the private transportation sector. Every year the TRB conference attracts thousands of public and private transportation personnel from the United States and around the world.

In January 1995, 70 Iowans attended the Transportation Research Board conference. Among them were Mark Nahra and Keith White, county engineers from Cedar and Sac counties, respectively, who attended as the newest county engineers to sit on the Iowa Highway Research Board. The IHRB hopes to revive county engineers' interest in the TRB and in the breadth of transportation research the TRB sponsors by sending IHRB members to the conference.

Nahra is enthusiastic about the conference. "It's important for county engineers to maintain an active interest in research," he says, "and being involved in things like the Iowa Highway Research Board and attending high-end meetings like the TRB conference once in a while help you understand the scope of transportation research.

"Plus, local governments—the counties and towns—need to be represented in these organizations so we can have some impact and guide the direction of research."

"A lot of the work of the TRB is done in committee," Nahra points out. "To influence national research, we need people on some of those committees." In particular, he says, TRB's committees on low volume roads, winter maintenance, traffic safety in maintenance and construction operations, and signing and marking materials would benefit from local input.

White calls the TRB conference "quite a spectacle."

"It is certainly unique among all the conferences I've attended," White says. "It gave me a glimpse of the broad spectrum of transportation research and the people involved. I'd like to find my way back there again."

With over 250 sessions offered on every facet of transportation, the four-day conference is, as White says, a spectacle. According to Vernon Marks,

research engineer at the Iowa Department of Transportation, the conference can be grueling. "Participants attend three, three-hour sessions a day, including one in the evening. These sessions are very high quality."

The IHRB sent Nahra and White to the 1995 TRB conference for less than \$1,000 each—a reasonable price for such a high calibre conference. Still, that's a lot for county engineers with limited travel budgets. "I want to go back [to the TRB], but that \$1,000 would be about one-seventh of my annual travel allowance," says Nahra.

Nahra appreciates the IHRB's financial support for his trip. "If the IHRB can send two county engineers to the TRB every year, maybe we'll be able to break into some committees where we can maintain a rotating membership."

Eldo Schornhorst is one of several retired Iowa county engineers who were active in the TRB for several years. "Our board of supervisors was very supportive," Schornhorst says. "It was written right into my contract that I would attend the TRB conference. It was good for the county." As a result of Schornhorst's TRB activities on the committee on low volume roads, for example, Shelby County built Iowa's first experimental wood bridge.

Schornhorst would encourage county engineers to consider a trip to the conference. "I always brought back some new ideas," he says.

The IHRB will send Randy Will and John Goode of Franklin and Cedar counties, respectively, to the 1996 TRB conference January 7-11, 1996, in Washington, D.C. For conference registration information, contact Vernon Marks, 515-239-1447. ■

ITC helps TRB celebrate

THE TRANSPORTATION RESEARCH BOARD turns 75 in November, and its annual conference on January 7-11, 1996, will be the setting for an all-out celebration. To commemorate the integral role Iowa played in starting the TRB in 1920, and the state's ongoing close relationship with the board, the Iowa Transportation Center and the Iowa Department of Transportation will host a special reception at the conference. Stop by and help us celebrate! ■

Improve your deicing tactics: prewet with salt brine



PREWETTING IS THE PROCESS of spraying deicing salt with a solution or liquid chemical before spreading the salt on the roadway. Prewetting the salt helps it work more effectively as a deicing agent for two reasons:

1. Wet salt clings to the road instead of bouncing off or being swept off by traffic. The result is that less salt is spread, saving money and minimizing the threat to the environment. According to Tom Donahey, director of maintenance programs at the Iowa Department of Transportation, studies in Europe and in this country have shown that, depending on the speed and number of vehicles driving over salted roadways in a given time, 25 to 65 percent more prewetted salt remains on the roadway than does dry salt.
2. To be effective as a deicing agent, salt requires moisture. Moisture dissolves the salt, releasing heat and thereby melting the ice and snow and breaking the ice-road bond. When temperatures drop below freezing, there is no moisture on the road, and salt alone is ineffective. Prewetting the salt, however, insures that there will be enough moisture to facilitate the melting process.

Prewetted salt, then, works faster and at lower temperatures than does dry salt, with less waste.

Liquid calcium chloride has been the prewetting agent of choice in Iowa since the late 1960s. It stays wet at very low temperatures, thereby helping salt to work effectively, and acts as a powerful deicing agent in itself. However, liquid calcium chloride has its drawbacks, especially in conditions of blowing snow. Because calcium chloride keeps the roadway wet long after the ice is gone, blowing snow sticks to the roadway and creates another kind of driving hazard. And liquid calcium chloride is relatively expensive.

Sodium chloride (salt) brine is a low-cost, effective alternative to liquid calcium chloride as a prewetting agent. It has a eutectic temperature of about -6 degrees Fahrenheit, not as low as calcium chloride but significantly lower than salt alone. Salt brine is extremely inexpensive—about six cents a gallon versus liquid calcium chloride's 63 cents a gallon.

Most important, salt brine does not remain wet on the roadway. After the ice and snow are melted, the pavement is dry.

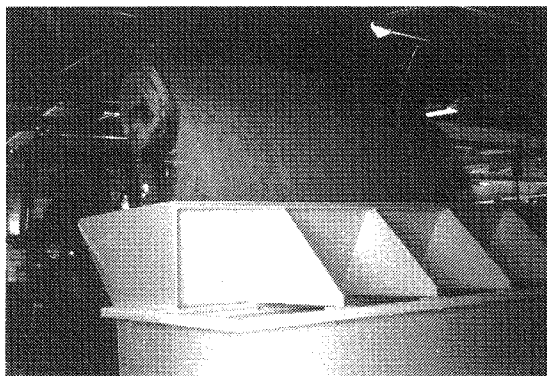
The Iowa Department of Transportation has been using salt brine as a prewetting agent at its Council Bluffs, Atlantic, and Des Moines garages and is so impressed that it is purchasing salt brine systems for all 30 of its garages serving interstate highways.

These systems include 600-gallon (approximately 2,270-liter) stationary brine makers and 60-gallon (approximately 225-liter; 100-gallon or approximately 375-liter on tandems) truck-mounted prewetting applicators that spray brine on the rock salt as it goes to the spinner. The system prewets salt with a 23 percent solution of rock salt and water.

The brine makers cost about \$5,000 each; the applicators, about \$1,100. Donahey estimates that the savings in material costs will allow the state to recover the cost of the salt brine systems in just one year.

Brine can also be applied to truckloads of salt with overhead spray bar systems, but because the salt will not be uniformly moistened, the results on the road will not be as good. Still, Donahey points out, the important thing is to get the salt wet. "In fact," says Donahey, "just wetting down a load of salt with a water hose is preferable to laying down dry salt."

For more information about salt brine prewetting systems, contact Tom Donahey, director of maintenance programs at the Iowa DOT, 515-239-1388. For information about building your own brine maker, contact Charles Pickett, highway maintenance supervisor at the Iowa DOT's Des Moines garage, 515-225-3322. ■



Salt is dumped into a new Iowa DOT brine maker. The stationary system makes 600 gallons of 23-percent solution at a time.

"Prewetted salt . . . works faster and at lower temperatures than does dry salt, with less waste."

Finland pulls plug on brine maker filter problems

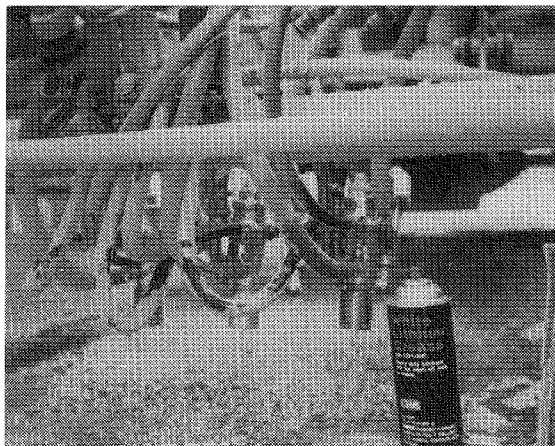
WHEN WORKING with salt brine prewetting systems, some Iowa maintenance personnel have struggled with plugged filters. Erika Tampo, an engineering student from Finland working for the Iowa DOT this summer, faxed the Finnish National Road Administration to find out if they've experienced similar problems with their salt brine systems. Indeed they have and the culprit, they say, is simply dirty salt. Dirt from the salt muddies the brine and plugs equipment filters.

The solution: Pay a little more for clean salt, and carefully avoid scooping up dirt when you load stockpiled salt. These precautions will greatly reduce the frequency of needed filter cleanings. Thanks to Erika and the FNRA. ■



Lithium grease helps paint guns

WE ARE GRATEFUL to Duane Janssen, equipment operator in the street department for the City of Marshalltown, Iowa, for this helpful tip.



Spraying clean paint guns with lithium grease keeps needles lubricated.

As you know, lithium grease is good for steering parts, hinges, latches, battery terminals, and a number of other uses. But did you know you can use it on your traffic line paint guns?

First thing in the morning, after cleaning your paint nozzles thoroughly the night before so that your gun bodies are clean, spray a coat of grease on the entire outer body of the spray guns and also on the bead guns. This will give the guns a good lubrication coating for the day and will help keep your needles in both guns lubricated.

At the end of the day, all you have to do is take a power washer to your paint guns and re-do the process the next morning.

For more information, call Duane Janssen, 515-754-5748.

CALL FOR PAPERS . . . continued from page 8

Transportation) were instrumental in establishing a national research program to support the development of a standard national highway system. The vehicle for this research program was and is the TRB, the most successful transportation research program in the world.

A conference honoring the TRB's 75th anniversary will be held at Iowa State University during Transportation Week 1996 (May 13-14). The conference will celebrate the past through presentations on the history of transportation research and will also provide a forum for exchanging information on current transportation issues.

You can participate in this event by attending and presenting at the conference. You are invited to submit an abstract of a formal presentation to be made during the conference.

Presentations from practitioners reporting on the use and the benefits of research or their own research are particularly welcome. Research findings of consultants, association staff members, and university researchers are also very welcome.

Conference abstracts will be selected by a committee of transportation professionals through a confidential review process. Authors of selected abstracts will be invited to submit a brief paper on the topic of their presentation to be bound into the conference proceedings.

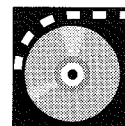
The conference will cover a broad spectrum of transportation issues. Papers covering any of the transportation modes are welcome.

Suggested subject areas include, but are not limited to, transportation infrastructure, transportation policy, passenger transportation, commercial transportation, transportation systems management, advanced transportation technology, safety and traffic engineering, and transportation planning.

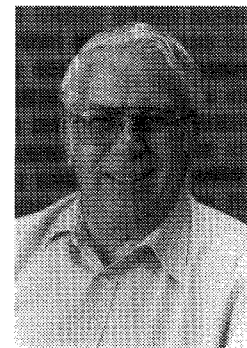
For a copy of the call for abstracts detailing the submission process, contact Vicki Gray, Iowa Transportation Center, (voice) 515-294-8103, (fax) 515-294-0467.

"You are invited to submit an abstract of a formal presentation to be made during the conference."

FOLLOWING IS A SAMPLING of new or popular materials available from the ITC library. To obtain materials or a catalog of library materials, contact Stan Ring, library coordinator, Monday, Wednesday, and Friday mornings at 515-294-9481. Or use this page as an order form. Check the box next to the materials you want and return this form to the Iowa Transportation Center, Iowa State University, 2521 Elwood Drive, Suite 125, Ames, Iowa 50010-8263. (Please limit your request to four items. Thank you.)



library materials



Stan Ring, library coordinator

Extra CD-I players available

THE LIBRARY now has five CD-I (compact disk interactive) players available for long-term (one- or two-month, renewable) loan. The players come with the CD of your choice (*Snow and Ice Control or Traffic Control in Construction Work Areas*) and simple instructions for using the equipment for in-house, individualized personnel training.

Publications

- The Role of Magnesium in Concrete Deterioration** (Iowa DOT, Iowa Highway Research Board, HR-355, 171 pages) Request #P1114

In this research, concrete samples from short service life concrete and durable concrete were studied using a petrographic microscope, a scanning electron microscope, and an electron microprobe to determine the reasons for differences in durability.
- Culvert Repair Practices Manual, Vol. I and II** (USDOT-FHWA-RD-94-096, 1995, 265 pages) Request #P1118 (I)
Request #P1119 (II)

These publications provide guidance on procedures for repairing problems that occur in metal and concrete culverts. A limited number of free copies are available.
- The Traffic Accident Investigation Manual** (Northwestern University Traffic Institute, 427 pages) Request #P1121

This publication gives specific instructions for traffic accident investigation.
- Proceedings: Symposium on Practical Solutions for Bridge Strengthening and Rehabilitation** (Iowa State University Department of Civil and Construction Engineering and the National Science Foundation, 392 pages) Request #P1126

These proceedings present papers on the results of actual cases of bridge strengthening and rehabilitation projects for practical answers to today's deficient bridges.
- Surface Rehabilitation Techniques: Design, Construction, and Performance of Micro-Surfacing (Instructor's Guide)** (USDOT-FHWA-SA-94-072, 1994, 35 pages) Request # P1125

This guide is designed for a workshop and should be useful for anyone interested in micro-surfacing.
- Bridge Overstress Criteria** (USDOT-FHWA-RD-92-082, 1995, 213 pages) Request #P1111

This report presents a reliability-based procedure to determine the optimal loads on highway bridges considering both static and dynamic effects. A truck weight (bridge) formula was developed according to AASHTO specifications.

Videotapes

- Ultra-Thin Whitetopping** (ACPA/NRMCA, 8:00 min.) Request #V406

This video describes ultra-thin PCC resurfacing over asphalt paving. It explains the applications and describes special techniques.
- The Snowfighters** (The Salt Institute, 21:00 min.) Request #V409

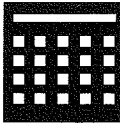
This general audience video discusses the importance of keeping streets and highways clean. It addresses economic concerns and reviews the importances of trained operators and good equipment.
- Setting Speed Limits** (Vermont Local Roads, 9:50 min.) Request #V407

This video explains how to conduct engineering surveys and traffic studies to set reasonable and proper speed limits in compliance with the MUTCD.
- Evaluation Procedures for Deicing Chemicals** (SHRP, 10:47 min.) Request #V405

This video outlines 12 new tests, describes the need for the tests, and outlines how they should be performed. A handbook supplement (H-332) is also available.

Name _____
 Address _____
 City/State/Zip _____
 Phone _____

Please send a complete catalog of all publications and audiovisual materials available from your office.



**MOVITE
theme:
"Trans-
portation
Engineering
Working
with the
Community"**

THE MISSOURI VALLEY Section-Institute of Transportation Engineers (MOVITE) will open its fall 1995 meeting in Springfield, Missouri, on October 25 with a workshop—Managing Traffic in New and Existing Neighborhoods—by the Mack-Blackwell National Rural Transportation Study Center at the University of Arkansas. For registration information, contact C. Jay Wynn, 417-864-1986. ■

October 1995

17, 24, 26	Improving Supervisory Skills	Storm Lake, Iowa City, Newton	Sharon Prochnow, 515-294-8103
18	Transitioning to Metric Teleconference (APWA and Oklahoma State University)	Downlink sites nationwide	Sara Cerwin, 816-472-6100
19	Surveying Conference I (sponsored by Iowa County Engineers Association (ICEA) and American Society of Civil Engineers (ASCE))	Ames	Don Wall, 515-294-3811
22-25	Rural Public: Intercity Bus Transportation	Des Moines	Duane Smith, 515-294-8103
25-27	MOVITE Fall 1995 Conference: "Transportation Engineering Working with the Community"	Springfield, Missouri	C. Jay Wynn, 417-864-1986
30-31	Video Applications for Traffic Management	Ames	Duane Smith, 515-294-8103

November 1995

1	Conference for Secondary Road Maintenance Supervisors	Ames	Duane Smith, 515-294-8103
2	Better Concrete Conference	Ames	Jim Cable, 515-294-2862
7-8	First Iowa Geographic Information Systems (GIS) Conference	Iowa City	Reg Souleyrette, 515-294-8103
7, 9	Maintaining Pavement into the Future	Council Bluffs, Davenport	Sharon Prochnow, 515-294-8103
8	ASCE Transportation Conference	Ames	Don Wall, 515-294-3811
10-11	ASCE/ICEA Surveying Conference II	Ames	Don Wall, 515-294-3811
13	ASCE Structural Design Conference	Ames	Don Wall, 515-294-3811
14-16	24th Annual Governor's Safety Conference	Des Moines	Ed Bigelow, 515-294-8103
15-16	Iowa State Association of Counties (ISAC) Fall 1995 Conference	Davenport	Duane Smith, 515-294-8103

December 1995

5-7	Iowa County Engineers Annual Conference	Ames	Jim Cable, 515-294-2862
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January 1996

7-11	Transportation Research Board (TRB) Annual Meeting	Washington, D.C.	Jim Cable, 515-294-2862
11-12	Culvert Design Workshop	Ames	Jim Cable, 515-294-2862
19	Society of Land Surveyors of Iowa (SLSI) Workshop	Ames	Jim Cable, 515-294-2862
30	Asphalt Paving Conference	Ames	Jim Cable, 515-294-2862
31-2/1	National Highway Institute (NHI) Hot Mix Asphalt Paving Workshop	Ames	Sharon Prochnow, 515-294-8103

P486-0524

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