TECHNOLOGY NEWS
Iowa's Local Technical Assistance Program (LTAP): providing transportation technology transfer for Iowa's cities and counties

July–August 2003

Acronyms in this issue

AASHTO	American Association of State Highway and Transportation Officials
CTRE	Center for Transportation Research and Education
FHWA	Federal Highway Administration
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
IASE	Iowa Associates of Safety Education
ITCSA	Iowa Traffic Control and Safety Association

Iowa is making TraCS nationwide

TraCS (Traffic and Criminal Software) is a flexible and easy-to-use software package for collecting and reporting crash and other data. TraCS was developed in Iowa and now is being adapted and used across the country as part of the National Model.

What's the National Model?
The National Model for the Statewide Application of Data Collection and Management Technology to Improve Highway Safety, known simply as "the National Model," is a model program for sharing information, resources, and technologies to improve highway safety.

The National Model

- minimizes disruption to traffic caused by roadway crashes and incidents;
- increases officer efficiency and safety;
- facilitates the rapid deployment of first responders;
- improves crash and roadway incident data quality and shortens data collection time;
- transmits data and images from both local and state law enforcement agencies to administrative offices in order to eliminate redundant data entry and expedite data processing;
- delivers an integrated data management solution that is capable of successfully incorporating multiple data sources and data types; and
- streamlines the communication of safety information to key stakeholders and extends the use of this information for safety and law enforcement programs.

TraCS is the National Model's critical field data collection component.

TraCS continued on page 2

Correction

In the March–April article "Enhanced sign for safer moving operations," we incorrectly used the word "border" to describe the fluorescent yellow green sheeting used as a background behind the orange construction sign. The sign is mounted on a piece of aluminum. The aluminum has a six-inch fluorescent yellow green border, which is visible around the outside edges of the sign.

Preparation of this newsletter was financed through LTAP, a nationwide effort financed jointly in Iowa by the FHWA and the Iowa DOT. Iowa's LTAP is housed and administered at ISU's Center for Transportation Research and Education (CTRE).

The mission of Iowa's LTAP:
To foster a safe, efficient, environmentally sound transportation system by improving skills and knowledge of local transportation providers though training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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Advantages of TraCS over traditional reporting
What is the advantage of TraCS over traditional crash data reporting? Electronic reporting such as that used by TraCS saves time, eliminates data entry duplication, and greatly improves data quality.

Before TraCS, reporting using paper methods often took 12 to 18 months from crash date for crash data to be input, cleaned up, and available for analysis. Using TraCS, the data are in a usable electronic database in as little as eight hours.

TraCS success in Iowa
TraCS was developed by the Iowa DOT, with support from the Iowa Department of Public Safety, FHWA, National Highway Traffic Safety Administration, Federal Motor Carrier Safety Administration, and others. CTRE developed the crash location component of the software package.

Within the state, 213 agencies—including 156 police departments, 55 sheriffs' offices, the Iowa State Patrol, and Iowa DOT motor vehicle enforcement officers—use TraCS. Each year in Iowa, about 115,000 citations (20 percent), 50,000 DOT inspections (100 percent), and 30,000 crash reports (55 percent) are completed using TraCS.

Cross-country customization
As a key component of the National Model, TraCS has also been adapted for use outside the lead state of Iowa. TraCS is currently being used in 19 states plus the Virgin Islands.

TraCS has successfully migrated to other states because the software is designed to be customizable. As additional states decide to use TraCS, they design and create their own state or local forms as needed.

For more information
For more information, contact Mary Jensen, TraCS program manager, 515-237-3235, mary.jensen@dot.state.ia.us, or visit www.dot.state.ia.us/natmodel/. •

Optimizing traffic signal phases for safety

USING INSTITUTE of Transportation Engineers (ITE) formulas to calculate the duration of yellow and all-red traffic signal phases may help reduce crashes at intersections.

Generally, a yellow signal phase should be followed by a brief period in which all signals at the intersection are red. This allows motorists entering the intersection on green or yellow plenty of time to clear the intersection before the signals for cross traffic turn green.

But just how long should the yellow and all-red phases last?

Traffic engineers traditionally rely on MUTCD guidelines (Section 4D.10), various traffic studies, and their own best judgment to set signal phase durations. But the results are fairly subjective.

In contrast, formulas for phase duration in the *ITE Traffic Engineering Handbook* are based on quantifiable variables like vehicle approach speed, reaction time, and approach grade. Any traffic engineer using these formulas to calculate phase durations for a particular intersection should arrive at the same durations.

In 2000, Richard A. Retting, Janella F. Chapline, and Allan F. Williams (Insurance Institute for Highway Safety) re-timed yellow and all-red traffic signal phase durations at several New York intersections according to ITE formulas. When they compared before-and-after crash rates, researchers discovered that reportable crashes at the re-timed intersections were reduced by eight percent. In addition, crashes involving pedestrians and bicyclists were reduced by 37 percent relative to a control group of intersections.

For more information
See the Insurance Institute for Highway Safety's April 28, 2001, issue of *Status Report*, www.hwysafety.org/sr.htm. For a copy of Retting's report, "Changes in Crash Risk Following Re-Timing of Traffic Signal Change Intervals," write to Publications, Insurance Institute for Highway Safety, 1005 North Glebe Road, Arlington, VA 22201.

For more information on the ITE recommendations for signal timing, consult the *ITE Traffic Engineering Handbook (5th Ed.)* pp. 480–482. This publication is available on loan from the Stan Ring Memorial Library, Item P 792. Contact Jim Hogan, library coordinator, 515-294-9481, hoganj@iastate.edu. •

Testing new pavement overlay

ALMOST 7,000 miles of Iowa's portland cement concrete (PCC) pavements have been resurfaced with asphalt and need to be resurfaced again. Jim Cable, associate professor of civil engineering at ISU, along with ISU's Center for Portland Cement Concrete Paving Technology, is evaluating a resurfacing technique that uses a thin layer of PCC instead of asphalt and is less expensive than traditional PCC overlays.

An unbonded PCC overlay has been constructed on a 9.55-mile stretch of Highway 13 north of Manchester. The new surface layer is much thinner than traditional PCC overlays, which can be nearly as thick as new pavement.

Like bonded overlays, in which all pavement layers absorb and distribute vehicle weight to the subgrade, this unbonded surface layer distributes vehicle weight through the PCC overlay and existing asphalt and PCC layers to the subgrade.

Variables being tested

Overlay thickness. Part of the overlay is 3-1/2 inches thick; the rest is 4-1/2 inches thick.

Joint layout. Joints were cut to divide the pavement into various sizes. Performance data will be collected from 100 test areas during the next five years.

Joint construction methods. Researchers are testing several new PCC jointing techniques and technologies, including not sealing transverse or longitudinal sawed joints and cutting longitudinal joints while the pavement was still wet (see picture).

Installation method. The thin PCC overlay is 28 feet wide—10 feet wider than the original pavement. The overlay was constructed with a new method that, in one pass, overlaid existing pavement and added five feet of PCC on each side (see figure). This method allowed engineers to open the pavement to traffic less than 30 hours after resurfacing.

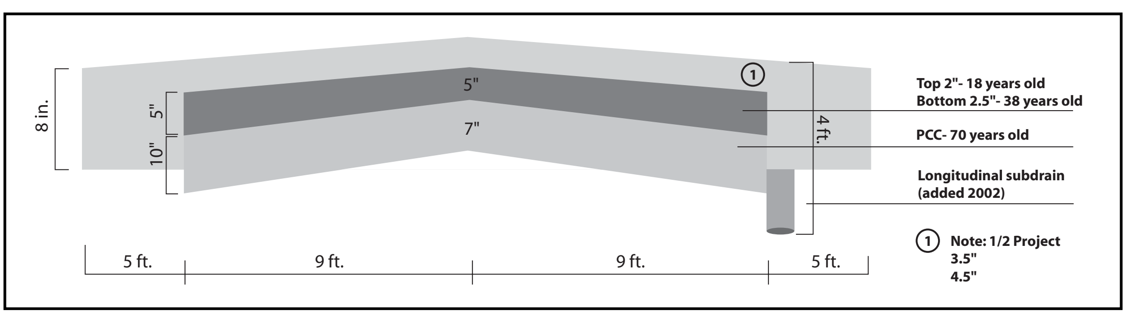
Overlay lifespan. Highway 13 was overlaid with PCC in 1931 and then with asphalt in 1963 and 1983. Researchers expect the new thin PCC overlay to last until 2021.

For more information

For information about this project, contact James K. Cable, 515-294-2862, jkcable@iastate.edu. •

Asphalt pavement before PCC was laid

PCC overlay with longitudinal joints cut into the pavement



The concrete overlay simultaneously overlays and widens the original pavement.

Drainage law and transportation: a manual for Iowa

THE CENTER for Transportation Research and Education is developing a manual addressing laws, regulations, and concerns related to drainage in Iowa from a transportation perspective. Your input is critical to the success of this project.

This comprehensive reference will serve a wide range of users, from engineers and drainage district officials to landowners and the general public. It will include

- an annotated presentation of Iowa Code and case law provisions,
- a compilation of frequently encountered questions regarding drainage issues, and
- a series of actual "case studies" with applied solutions.

CTRE is developing a brief, straightforward survey to gather information and advice from counties, larger cities, drainage districts, Iowa DOT, consulting engineers, and other potential users of this manual. When you receive the survey in the mail, please complete and return it promptly.

If you have any questions about this project or the survey, contact Tom McDonald, safety circuit rider, 515-294-6384, tmcdonal@iastate.edu. •

Retrofitting an LED pedestrian signal

EDITOR'S NOTE: The "LED pedestrian signal retrofit" is one of several winning innovations from the "Better Mouse-trap" competition at the Iowa Maintenance Training Expo in 2002. In each issue of Technology News we're highlighting one of the winners. For information about other winning "mousetraps," see CTRE's website: www.ctre.iastate.edu/ (see "Popular Links").

Jim DeWitt, public works crew leader for the City of Clive, wanted to make sure the city's new LED pedestrian signals were easy to replace if and when necessary. He also didn't want to get zapped when installing them. The way the signal heads are designed makes it a little too easy for electricity to arc between the wires and the jamb nut.

For each head, DeWitt used two strips of 1/8-inch by 12-inch by 1/2-inch plexi glass to move the terminal to the middle of the housing. The materials cost 50 cents per housing. Labor took about 15 minutes per head. The city has retrofitted 56 heads.

For more information about the retrofit process, contact Jim DeWitt, 515-223-6231, jdewitt@ci.clive.ia.us. •

Understanding the basics of concrete mixture chemistry

EVERYONE INVOLVED in constructing concrete pavements—roadway designers, mixture designers, building contractors and supervisors, technicians, materials suppliers, and road workers—should have a basic understanding of today's complex mixture designs.

A relatively recent challenge
For nearly a century, concrete pavements have been constructed with the same basic materials: aggregate (gravel or crushed rock and sand), portland cement, and water. The cement and water make a paste that hardens and holds the aggregate together, forming a strong, durable pavement. See ***Equation 1*** below.

In the mid-1950s, Iowa's concrete paving industry began to use more crushed stone than gravel because of its availability. And additives were introduced into mixtures to improve air entrainment in finished concrete, which improves its durability.

Then in the 1980s, prompted primarily by new environmental requirements and cost-reduction efforts, the industry began supplementing portland cement with recycled products that have cementitious properties, like fly ash, ground granulated blast furnace slag, and silica fume. The industry also began to use a variety of chemical admixtures in addition to air entraining admixtures. Today, mineral and chemical additives are used to fine-tune mixtures according to variations in aggregate, construction and weather conditions, and desired characteristics of the finished pavement. See ***Equation 2*** below.

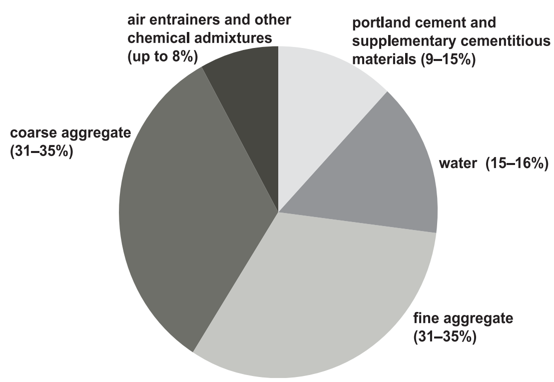
This complexity can cause new challenges. Sometimes aggregates and admixtures are incompatible. Various additives can affect the amount of water needed for hydration, the quality of the bond between aggregate and paste, the uniformity and workability of the mix, the rate of hydration, the timing of initial set and final set, and many other characteristics of the plastic mixture and, eventually, the hardened concrete.

A new resource
A new publication, *Formation and Characteristics of Portland Cement Concrete for Pavements: The Basics*, can help. This technical brief provides a clear, concise overview of the interactions among aggregate, portland cement, supplementary cementitious materials, chemical admixtures, and water and how those interactions can affect the art of constructing durable concrete pavements.

It was developed by ISU's Center for Portland Cement Concrete Pavement Technology, which is sponsored by the Iowa Concrete Paving Association and the Iowa DOT.

The technical note is being distributed by the American Concrete Pavement Association. Several ACPA chapters, including those in Iowa, Wisconsin, and Michigan, are using it for training purposes.

For more information
To review a copy, contact Jim Hogan, LTAP library coordinator, 515-294-9481, hoganj@iastate.edu. For your own copies, call 1-800-868-6733, or use the online order form, www.pavement.com/. Refer to product code SP486P. •



Chemical admixtures and supplementary cementitious materials make up a small percentage of concrete mixtures but seriously complicate mixture chemistry. (Percentages shown are by volume.)

Equation 1

portland cement + water + basic aggregate = concrete

Equation 2

portland cement + water + supplementary cementitious materials (mineral additives: • slag • pozzolans) + chemical additives (• air entrainers • water reducers • etc.) + aggregate = today's concrete

Developing a rural roadside safety program

Tom McDonald, Safety Circuit Rider

EDITOR'S NOTE: In 1999, almost 30 percent of vehicle fatalities in Iowa occurred off the roadway. This is the second in a two-part series of articles about enhancing the safety of rural roadsides. The first article, in the May–June 2003 issue of Technology News, introduced concepts and resources. This article discusses proactive local efforts.

The following steps outline the elements of a proactive roadside-safety program for local agencies:

1. Gather support from the public and elected officials.
2. Take an inventory of roadside conditions and identify problem locations using
   - crash records
   - staff observations and public input
   - noted traffic operational difficulties
   - complaints
   - routine inspections of roadsides
3. Develop a list of cost-effective improvements and set priorities.
4. Integrate safety into project improvements where possible.

Develop public support

Communication is the key. Effective communication efforts include preparing informational news releases for local media about roadside safety, posting information on the county website, and presenting information to local groups, including the board of supervisors, developers, and landscapers. Story County, for example, developed a one-page flier about roadside safety to distribute to individuals and groups.

Whenever possible talk one-on-one with local citizens about your roadside safety program. This is especially important for any adjacent property owners who might be affected by safety improvements such as tree removals.

Story County also developed a roadside right-of-way ordinance. Public hearings regarding development of the ordinance provided opportunities to talk directly with the public and allowed people to voice their concerns or propose revisions. Bob Sperry, Story County engineer, says that comments at the public hearings resulted in important clarifications in the final ordinance.

Take an inventory

An inventory of possible safety hazards could be a formal safety audit or simply staff notes made during routine patrols. The latter procedure helps increase supervisors' and staff awareness of unsafe conditions.

Locations with high potential for vehicles leaving the road should be of particular interest.

Each class of roadway—farm to market, federal aid secondary, collector, or local—has unique requirements for clear zones and intuitive priorities for action at locations like sharp curves, T-intersections, narrow roadways, and steep slopes.

Each class of roadway–farm to market, federal aid secondary, collector, or local–has unique requirements for clear zones.

A checklist can be helpful.

Each of the following features is a potential hazard if located in the clear zone:

1. Large trees (over 4-in diameter)
2. Noncrashworthy mail box supports
3. Driveways with steep side slopes or retaining walls

   Because of the possibly sensitive public-relations nature of these three features, talk to property owners well in advance of any action. Emphasize the potential hazard for drivers, and negotiate hazard removal or other mitigation.

4. Utility poles and/or guy wire supports, particularly isolated, individual poles

If there is adequate right of way to allow relocation of individual poles, work with the utility company to do so.

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Roadside safety continued from page 6

5. Large culverts (> 4–6 ft opening) or any culvert with a headwall extending above the adjacent shoulder surface
6. Unused cattle passes
7. Bridges with inadequate handrails and/or unprotected end posts
8. Guardrails seriously out of date or needing repairs
9. Noncrashworthy sign supports (e.g., wooden posts larger than 4x4 inches)

   In some situations, extensive modifications to features numbered 5–9 to meet current standards may not be cost effective. The following low-cost improvements, however, can be made by crews as their schedules permit:

   - fill-in of unused cattle passes (with the property owner's agreement)
   - some guard rail repairs,
   - removal of high culvert headwalls
   - drilling of large wooden sign supports to achieve crashworthiness

10. T- intersections without safety ramps
11. Foreslopes with severe erosion
12. Significant, recurring drop-offs adjacent to pavement edges
13. Sharp curves and high fills without shielding

    Again, fully mitigating problem areas numbered 10–13 may not be possible from a benefit-cost standpoint. Still, low-cost strategies, like signing, delineating, and repairing erosion with ditch cleanout material, can be accomplished in key areas.

    When assessing high-priority routes for possible concerns, be especially attentive for isolated conditions of any type that may be problems for inattentive drivers. Such conditions might include the following:

14. narrow bridges
15. short, narrow width roadway sections
16. sharp curves
17. hills

Identify cost-effective mitigation measures and set priorities
Balancing roadside safety needs with other budgetary priorities is a significant responsibility of county engineers. All improvements must be evaluated for cost effectiveness, especially on lower volume roads.

Because many crashes on local rural roads are single-vehicle, run-off-the-road incidents, pay special attention to improvements that create safe, forgiving roadsides and allow driver error without unduly serious consequences.

Balancing roadside safety needs with other budgetary priorities is a significant responsibility of county engineers.

Integrate safety into road improvements
Safety improvements can often be made most cost effectively as part of construction projects, especially pavement resurfacing, restoration, or rehabilitation activities. When you plan a 3R project, carefully consider if needed safety improvements can be incorporated into it.

The National Highway Institute's training course based on the *Roadside Design Guide* is helpful for designing safety improvements on higher volume roadways. A version of this course has been developed with more application for local agencies and will be available soon. In addition, CTRE is working with the Iowa DOT to modify a workshop addressing safety improvements on 3R projects for local agencies. It is currently planned to offer a two-day workshop on roadside safety issues for both 3R improvements and new construction to interested engineers and technicians later this year.

For more information
Contact Tom McDonald, safety circuit rider, 515-294-6384, tmcdonal@iastate.edu. The Local Systems Office at the Iowa DOT and engineers in the district offices can also be excellent sources of information and advice on this topic, as are Instructional Memoranda issued for county engineers. •

Hello and goodbye to LTAP advisory board members

Duane Smith, Iowa LTAP Director

DURING THE past several months, the Iowa LTAP advisory board has experienced some changes in membership. We would like to thank those great individuals who are moving on to other projects. They have been a great asset to LTAP. Specifically we would like to thank the following individuals and wish them well in their future pursuits.

- Wade Weiss, Greene County engineer, who served as the Iowa Highway Research Board representative
- Tom Parham, former Iowa DOT local systems engineer, who is now the central region Federal Aviation Administration engineer in Missouri
- Susan Klekar, former FHWA Iowa Division representative, who is now the FHWA division administrator for the state of Nevada
- Kevin Gilchrist, Des Moines MPO representative

We would also like to welcome new representatives to the advisory board. They include:

- Greg Parker, Cedar Rapids city streets engineer, who is serving on the advisory board as the Iowa Highway Research Board representative
- Chris Whitaker, Region XII Council of Governments transportation planner, who is serving on the advisory board as the MPO/RPA representative

We know that these individuals will help the Iowa LTAP continue providing workshops and services to the transportation community. •

LTAP advisory board:
Front row (from left): John Goode, Duane Smith, Chris Whitaker (new member), Saleem Baig, Gary Fox, Sue Klekar
Back row (from left): Larry Jesse, Wally Mook, Neil Guess, Bret Hodne, Bob Sperry, Greg Parker (new member)

Iowa's first Roads Scholars recognized

CONGRATULATIONS to the following transportation staff from state, city, and county shops and other organizations across Iowa who have recently earned Roads Scholar I certificates. The certificates reflect at least 30 hours of participation in continuing education events since January 2000. (Future Roads Scholars I will be recognized periodically in this newsletter.)

Staff who have earned Roads Scholar II status (at least 50 hours of continuing education) will be recognized at the Iowa Maintenance Training Expo in Ames, September 9–10.

Jeff Anderson, City of West Des Moines
Chris Archer, Pocahontas County
James Beckman, Iowa DOT
Stephen Benda, Iowa DOT
Jeff Biddle, Story County

Donnie Bond, Montgomery County
Ted Briggs, Iowa DOT
Russell Brown, Iowa DOT - Anamosa
Jim Capps, City of Burlington
Cal Clark, Iowa DOT

Charles Cole, City of Ankeny
Larry Cornell, Johnson County
Max Cox, Monroe County
John Cunningham, Iowa Concrete Paving Assn
Randy Cutler, Van Buren County

Mark Dean, Iowa DOT
James Dennis, Johnson County
Jim DeWitt, City of Clive
Mark Fischer, Clayton County
Larry Fitchhorn, Hamilton County

Tom French, Buena Vista County
Larry Frueh, Iowa DOT
Dennis Gaulke, City of Ankeny
Howard Gay, Mahaska County
Chris Gerling, Iowa DOT

Jared Greiner, Keokuk County
Dennis Guillaume, City of Ankeny
Rick Harbaugh, Delaware County
Paul Harry, Iowa DOT
Tim Herrstrom, Boone County

John Huff, Iowa DOT
David Imoehl, City of Postville
Craig Kirk, Story County
Dave Lay, City of West Des Moines
Mark Lloyd, Iowa DOT - Malcom

Dennis Lovell, Cedar County
John Lyle, Iowa DOT
Kevin Marshall, Dallas County
Bill McDonald, Clinton County
Jeramy McNace, Boone County

Brian Messer, Jefferson County
Mike Neuman, City of West Des Moines
Travis Nitcher, Iowa DOT
Mike O'Connor, Osceola County
Scott Olson, City of Waukee

James Owens, Poweshiek County
Steve Park, Davis County
Dean Potratz, Iowa DOT
Patrick Powell, Jones County
Jeff Price, Taylor County

Richard Pross, Iowa DOT
Gary Rank, City of West Des Moines
Julius Reed, Osceola County
Michael Rodwell, Mahaska County
Kelly Sand, City of West Des Moines

Mark Scott, Hamilton County
David Sharp, Bremer County
Bert Shaw, Iowa DOT
Jeff Stoffa, Iowa DOT
Mark Stoneking, Jones Co. Sec Roads
Dave Sturm, City of Carroll

Wayne Thornsberry, Van Buren County
Tim Timmins, Iowa DOT
Dennis Vinson, Iowa DOT
Larry Wedo, Fayette County
Ron Wiese, City of West Des Moines
Dan Wolfe, Iowa DOT