

CTRE en route

Summer 2006

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Demonstrating the feasibility of hybrid electric school buses



The hybrid electric school buses will look like all the other standard diesel buses.

Kids in 11 different states, including Iowa, will ride the first hybrid electric school buses late this year.

CTRE will evaluate the fuel economy and the emissions of the two buses that will be deployed in two Iowa school districts.

Plug-in hybrid electric school buses

School buses are an excellent application of a new type of hybrid—a plug-in hybrid electric vehicle. It plugs into the electrical grid overnight to recharge the batteries, which reduces the amount of time the internal combustion engine has to run to recharge the batteries. This reduces fuel consumption and emissions.

Standard Type C school buses average 6.5 miles per gallon (mpg). The hybrid electric buses should average 12.4 mpg, a 40 percent increase in fuel efficiency. With the high cost of fuel driving up schools' transportation budgets, such a dramatic increase in fuel efficiency could make these buses quite popular.

Perhaps more important, the hybrid electric school buses will reduce emissions dramatically, which will be better for kids' health.

National project

This work is part of a national project led by Advanced Energy, a non-profit organization in North Carolina, to develop hybrid vehicle technology for commercialization in school buses. The ultimate goal of the project is to demonstrate the market to a manufacturer who will then mass produce the vehicles.

To help demonstrate the market, Advanced Energy formed a national buyers' consortium. The consortium coordinates various funding sources.

Iowa piece

In Iowa, CTRE administered the bus purchase on behalf of the Sigourney Community School District and Nevada Community School District. The school districts each kicked in \$60,000, which is the typical purchase price of a standard diesel, 65-passenger school bus. The hybrid electric school buses cost about \$200,000 each.

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Additional Iowa partners include the Iowa Department of Education, Iowa School Administrators, Iowa Department of Natural Resources, and the Iowa Energy Center. These partners have contributed financial and/or in-kind support for the purchase.

Bus manufacturers

The hybrid electric school buses are being built by IC Corporation in collaboration with Enova Systems, Inc.

For more information about the national project, see www.hybridschoolbus.org. For more information about CTRE's role on the project, contact Dennis Kroeger, kroeger@iastate.edu, 515-296-0910.

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CTRE's 2004–2005 biennial report

In the spring of 2006, CTRE published its [latest biennial report](#) (9.5 mb pdf). It includes the typical info on where CTRE's funding came from and how we spent it.

But the really cool part is in the middle where you get a graphic overview of CTRE's research projects in 2004–2005. See the image below.

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CTRE RESEARCH REVIEW

CTRE research at a glance

This section highlights research projects that are representative of CTRE's broad spectrum of interest and expertise.

The full list of projects that were completed or in progress during 2004-2005 begins on page 20.

Safety

1 School Zone Safety Handbook

We help schools address safety and operations on school grounds and public streets adjacent to elementary and middle schools in Iowa.

Crash Mapping Analysis Tool

Software developed for the mapping and analysis of statewide crash report data collected and maintained by a jurisdiction.

Rural Expressway Intersections Synthesis of Practice and Crash Analysis

A national synthesis of rural expressway, two-way stop-controlled (TWSC) intersection safety strategies and intersection designs; also includes an analysis of Iowa expressway TWSC intersection crash characteristics.

Safety Impacts of Pavement Edge Dropoffs

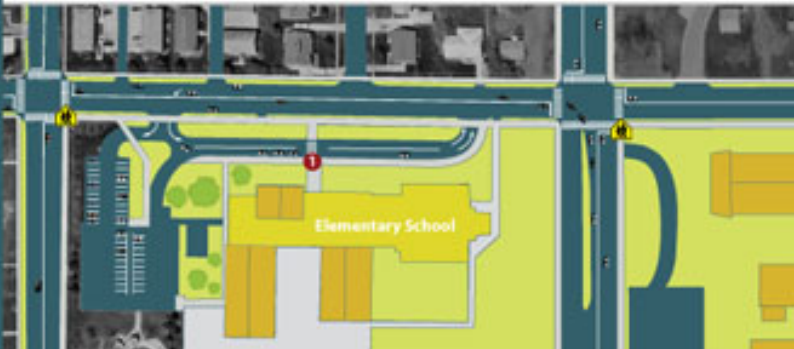
Analyzing existing guidelines and standards and their applications to better understand related problems.

Appropriate Traffic Calming Techniques for Small Iowa Communities

Providing guidance that can be used by both engineers and communities to select economically feasible alternatives for conditions typical of Iowa's county roads and other major roads within small rural communities.

Impact of Left-Turn Phasing on Older and Younger Drivers at High-Speed Signalized Intersections

Overall, left-turn crash rates indicated that protected phasing is much safer than protected/permitted and permitted phasing.



Sample page from the middle of CTRE's biennial report that shows "research at a glance"

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CTRE's director departs



Steve Andrie
CTRE Director, 1999–2006

Steve Andrie served as CTRE's director from November 1999 through June 2006. He left this summer to take a job with the Transportation Research Board where he's managing the capacity focus area within the Strategic Highway Research Program II (see <http://www.trb.org/shrpii/default.asp>).

Under Steve's leadership, CTRE grew into quite a handsome, healthy research center, from just under \$4 million in annual funding in fiscal year 2000 to about \$10.5 million in fiscal year 2006. While some of that growth was due to programs that were already in the works when he arrived, Steve was an excellent proponent of CTRE.

During his tenure,

- Seven new "logo" programs/centers got their start at CTRE, including the following:
 - The PCC Center, which evolved into the [National Concrete Pavement Technology Center](#) and led to national recognition for Iowa State University.
 - Statewide Urban Design and Specifications (SUDAS). Steve says, "It meets a very real need. It provides a mechanism to implement research because approved methods go 'in the book' and are followed."
- CTRE developed ever stronger relationships with long-term partners such as the Iowa Department of Transportation and the Iowa Governor's Traffic Safety Bureau. Steve says, "I am proud that the relationship with the Iowa DOT keeps getting stronger and more varied. Both CTRE and the Iowa DOT benefit from the relationship."
- CTRE won nationally competitive research projects, including three National Cooperative Highway Research Program (NCHRP) projects. CTRE's first NCHRP project was the Future Strategic Highway Research Program: Study 1 Detailed Planning for Research on Accelerating the Renewal of America's Highways ("Renewal").
- CTRE received significant gifts that facilitated the purchase of two mobile labs and outfitting the PCC research lab. "They are evidence of trust in CTRE by the sponsors," Steve says. "The support would never have happened without trust."

Steve says, "I am proudest of the collaborative and supportive environment at CTRE. People want to work there and more and more faculty choose to work with CTRE. We have an atmosphere of collegiality, trust, and friendship that makes working fun. Continuing that atmosphere is up to everyone."

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CTRE in transition

By Lowell Greimann, Interim Director



Lowell Greimann
CTRE Interim Director

As an article elsewhere in *CTRE en route* describes, Steve Andrlé has resigned as director of CTRE. As the record indicates, the growth at CTRE during Steve's tenure has been phenomenal.

Personally, Steve and I developed a trusting business and personal relationship over the past six and a half years—he as director of CTRE and I as chair of Iowa State's Department of Civil, Construction, and Environmental Engineering (CCEE). I very much enjoyed this relationship. It was fun for me to watch Steve operate in the interesting environment at CTRE with a diverse array of professionals, ranging from people with many years of experience in the transportation arena to young faculty members who have just recently received their Ph.D.

A committee has been formed to lead the search for a new director. It is being chaired by Dr. Mark Kushner, Dean of the College of Engineering at Iowa State. Advertisements soliciting applications have been placed in key national journals and publications. Search committee members and others are encouraging qualified people from around the nation to apply. The closing date for applications is September 1 or until the position is filled.

CTRE has several selling points for people who may be considering the [director position](#), but the most salient are these:

- Mostly, of course, it is the people within CTRE. They know that working together as a team is most productive and they know how to provide a service to our customers, an obvious key to our successful growth.
- The special relationship between CTRE; the Iowa Department of Transportation; Iowa State University, especially CCEE; and the transportation industry, e.g., contractors and industrial partners like the Iowa Concrete Paving Association is quite unique. I have not seen anything like this vibrant partnership anywhere else.

For this and other reasons, I am really enjoying my experience here.

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Recently completed research

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Concrete

- [Evaluation of Transverse Joint Forming Methods in PCC Pavement \(TR-532\)](#)
- [Iowa Data Collection and Analysis for the 2005-2006 National Surface Characteristics Field Experiment Plan \(TR-537\)](#)
- [Mix Design Development for Pervious Concrete in Cold Weather Climates](#)

Construction

- [Field Evaluation of Compaction Monitoring Technology: Phase II](#)

Planning

- [Development of a Performance Measures-based Planning System \(State Transportation Plan Update Assistance\)](#)
- [SHRP-II Revision, NCHRP Project 20-58\(04\)A](#)

Safety

- [Enhancements to the Iowa DOT Crash Mapping Analysis Tool \(CMAT\) Software](#)
- [Safety Impacts of Pavement Edge Dropoffs](#)

Training

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Center for Transportation
Research and Education

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- [Developing an Effective Construction Training Program for Hispanic Supervisors and Craft Workers, Phase III](#)
- [Manual of Practice for Roadway Maintenance Workers \(TR-514\)](#)

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Recently started research

Below is a list of projects that were started between February and August 2006. All links will take you out of this newsletter site.

Asphalt

- [Assessment of Iowa Climatic Data and Its Integration into the AASHTO Mechanistic-Empirical Pavement Design Procedure](#)
- [Evaluation of Hot Mix Asphalt Moisture Sensitivity Using the Nottingham Asphalt Test Equipment, Phase II \(TR-555\)](#)
- [Evaluation of Lignin Derived from Agricultural Co-products as an Antioxidant in Asphalt, TR-577](#)
- [Testing Iowa Asphalt Mixtures for the AASHTO Mechanistic-Empirical Pavement Design Procedure](#)

Asset management

- [Iowa DOT Pavement Marking Management System: Research and Field Evaluation Assistance](#)

Bridges

- [Evaluation of a Bridge Constructed Using Accelerated Construction Practices](#)
- [Feasibility Investigation of Segmentally Precast Bridge Piers for Accelerated Construction](#)
- [Laboratory and Field Testing and Evaluation of Precast Bridge Elements](#)
- [Testing and Long-Term Monitoring of 9th Street Bridge Over I-235 in Des Moines: Integral Abutments Supported on Steel Pile/Concrete Drilled Shaft in Glacial Clay](#)

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Concrete

- [Performance Evaluation of Concrete Pavement Granular Subbase \(TR-554\)](#)
- [Use of Ultra-High Performance Concrete in Geotechnical and Sub-structure Applications \(TR-558\)](#)

ITS

- [Iowa DOT ITS Operations Manual](#)

Miscellaneous

- [Hybrid Electric School Bus Deployment and Evaluation](#)
- [Business and Economic Impacts Assessment: Anoka County, Minnesota](#)
- [Field Evaluation of Timber Preservation Treatments for Iowa Highway Applications \(IHRB-05-10\)](#)

Safety

- [Clear Zone: A Synthesis of Practice and Benefits of Meeting the Ten-Foot Clear Zone Goal on Urban Streets](#)
- [Cooperative Intersection Collision Avoidance System Benefit/Cost Analysis Tool](#)
- [Crash Record Validation Study](#)
- [Evaluation of 70 mph Speed Limit](#)
- [FHWA Implementation Guide](#)
- [Modern Roundabout Guidance for the Iowa DOT](#)
- [New Implementation of the Incident Location Tool](#)

Training

- [Erosion and Sediment Control Training Workshops](#)

Winter weather

- [Improving Snow Plow Design: Highway Maintenance Concept Vehicle, Phase V](#)

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Tech transfer summaries

Below is a list of research summaries completed since February 2006.

All links are to pdf files. To view pdf files, you may need to download the [free Adobe Acrobat Reader](#).

Concrete

- [Current Concrete Pavement Surface Texturing Practices in Iowa](#)
- [Feasibility of Forming Transverse Joints with Joint Forming Devices](#)
- [Feasibility of Slip-Form Paving with Self-Consolidating Concrete](#)
- [Monitoring Heat Evolution of Concrete Mixtures](#)
- [New Tests and Field Observations in the MCO Project](#)
- [Testing Structural Behavior of Alternative Dowel Bars](#)

Construction

- [Field Evaluation of Compaction Monitoring Technology](#)
- [Innovative Solutions for Slope Stability Reinforcement and Characterization](#)
- [Performance Effectiveness of Contracting Techniques](#)

Safety

- [Four-Lane to Three-Lane Conversions](#)
- [Intersection Traffic Control in Very Low Volume Rural Areas](#)
- [Safety Effectiveness of High-Speed Expressway Signal](#)

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Training

- [Effective Language and Cultural Training for Hispanic Workers and American Supervisors](#)

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