InTrans Mission

To develop and implement innovative methods, materials, and technologies for improving transportation system efficiency, safety, reliability, and sustainability while improving the learning environment of students, faculty, and staff in transportation-related fields.

Abbreviations and Acronyms

AMPP  Asphalt Materials and Pavements Program*
BEC    Bridge Engineering Center*
CEER   Center for Earthworks Engineering Research*
CMAT   Construction Management and Technology*
CNCS   Center for Nanotechnology in Cementitious Systems*
CP Tech Center National Concrete Pavement Technology Center*
CTRE   Center for Transportation Research and Education*
C-WIMS Center for Weather Impacts on Mobility and Safety*
DOT    Department of Transportation
FHWA   Federal Highway Administration
InTrans Institute for Transportation
IPMP   Iowa Pavement Management Program*
ITSDS  Iowa Traffic Safety Data Service*
LTAP   Local Technical Assistance Program*
MTC    Midwest Transportation Consortium*
NAS    National Academies of Science
NCHRP  National Cooperative Highway Research Program
NSF    National Science Foundation
RIMOS  Roadway Infrastructure Management Operations Systems*
SHRP2  Strategic Highway Research Program 2
STSP   Sustainable Transportation Systems Program*
SUDAS  Statewide Urban Design and Specifications*
TRB    Transportation Research Board

*Administered by InTrans
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From the Director

The organization that had been the Center for Transportation Research and Education (CTRE) at Iowa State University began fiscal year 2010 with a new name—the Institute for Transportation, which we regularly shorten to InTrans. The change from university center to university institute more accurately represents InTrans's role as the administrative and physical home for several diverse yet associated centers and long-term funded programs that conduct transportation-related research, education, and outreach activities at ISU. It also marks the organization's evolution into one of the top 10 university-based transportation research programs in the country, as determined by annual budgets.

During the two years covered by this report, InTrans has continued to evolve. The level of funding from federal sources is at an all-time high, reflecting competitive awards from the National Academy of Sciences (including projects supported by the National Cooperative Highway Research Program and the Strategic Highway Research Program-2), the National Science Foundation, the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, the Transportation Research Board, and the Federal Highway Administration. The scope of our federally funded activities is broad. InTrans's Bridge Engineering Center, for example, administers a national program for wood structures—the National Center for Wood in Transportation Structures—which is a cooperative effort with the U.S.D.A.’s Forest Service/Forest Products Laboratory and the National Park Service. In a different sphere entirely, Go!—a relatively new, interactive, online resource about careers in transportation—is reaching out to young people across the country as universities and the transportation industry compete to recruit the best and brightest students to transportation-related careers. Go! is primarily supported by the U.S. DOT University Transportation Center Program's tier-one center at InTrans, the Midwest Transportation Consortium, and the Federal Highway Administration. Other examples include a project on management strategies for complex roadway construction projects, an evaluation of data needs and analysis methods for a naturalistic driving study of lane departures, and a study of geotechnical solutions to enhance the pavement platform, all funded by SHRP2.

Of course, InTrans continues to serve its core local and regional partners. The Iowa Department of Transportation, for example, remains a primary sponsor of research and outreach activities that enhance Iowa's primary and secondary roadway systems and city streets. InTrans continues its now decade-long administration of SUDAS, a program for developing and updating statewide designs and specifications for urban improvements that helps streamline bidding processes, saves costs, and standardizes urban improvements from one community to the next. And Iowa’s Local Technical Assistance Program, the FHWA-sponsored transportation technology transfer program for Iowa’s cities and counties (and the initial activity that has evolved into InTrans), remains a core program.

Educating the next generation of transportation professionals is still at the heart of InTrans’s mission and is a major element of most of our activities. As you will see in this report, our students are performing at award-winning levels.

As InTrans continues to move forward, these few pages provide a snapshot in time. Enjoy.
InTrans helps identify and resolve local, regional, and national transportation-related challenges in a variety of ways: conducting research • quick-response information gathering • developing, field-testing, and helping organizations implement new technologies and innovations • providing technical support and advice • conducting professional training (workshops, demonstration projects, technical briefs, manuals, online modules) • preparing the future transportation workforce • fostering public-private collaborations that enhance efficiencies and maximize impacts • communicating research results

Areas of Expertise
InTrans has cultivated nationally recognized expertise in many areas: transportation safety • management systems (roadways, bridges and structures, markings, signs) • traffic engineering and operations • policy and planning • earthworks and construction technologies • pavement materials for both portland cement concrete and asphalt concrete (including nanotechnologies for cements) • bridges and structures • transportation sustainability • urban designs and specifications • transportation applications of GIS • weather and transportation • outreach, training, and technology transfer • transportation communications • workforce development
Partners

Long gone are the days when service organizations could (or thought they could) maximize their effectiveness by going it alone. During its almost 30 years, InTrans has been at the front of today’s collaboration paradigm, developing productive relationships and collaborating with dozens of organizations as partners and/or sponsors.

When you consider its work with and for federal, state, city, and county partners, individual industries and industry associations, almost 30 departments, institutes, and centers at Iowa State University (ISU), and more than 15 other universities, InTrans is conducting activities and/or providing benefits in 43 of the 50 states and in 15 countries across the globe.

InTrans’s primary public agency partner is the Iowa Department of Transportation (DOT); see the box at right. Through InTrans, ISU participates in a research collaboration agreement among the Iowa DOT and Iowa’s two other state universities—the University of Northern Iowa and the University of Iowa—to coordinate resources and expertise.

Within ISU, InTrans’s primary research and education partner is the Department of Civil, Construction, and Environmental Engineering in the College of Engineering. The institute also partners regularly with the College of Design (primarily the Department of Community and Regional Planning) and the College of Business (Logistics, Operations, and Management).

Iowa DOT: A special relationship

InTrans has a special relationship with its primary sponsor, the Iowa DOT. Under an ongoing umbrella agreement with the Iowa DOT, which is unique in the country, the institute

- Conducts applied, fast-track, and basic research projects.
- Provides technical support services.
- Oversees statewide asset management programs.
- Facilitates focus groups to set the Iowa DOT’s research agenda.
- Shares faculty to conduct research in the Iowa DOT’s high-priority areas (concrete, asphalt, bridges and structures, traffic engineering, and safety).
InTrans has evolved from a $100,000-per-year unit serving Iowa’s local street and road agencies to a multi-million-dollar research institute addressing local, state, national, and international transportation challenges.

The collection of initiatives that make up InTrans has its roots in a 1983 Federal Highway Administration (FHWA) grant to ISU to manage one of 10 original state-based technology transfer programs for local transportation agencies (today’s Local Technical Assistance Program, or LTAP).

Other major grants followed, most notably the first U.S. DOT Region 7 University Transportation Center (UTC) in 1988, called the Midwest Transportation Center. Expert faculty and staff were strategically hired to develop pools of expertise and multidisciplinary perspectives. Several of these areas became long-term centers or programs, which are summarized beginning on page 17.

InTrans is the umbrella administrative organization for all these initiatives. Its name has evolved from the Iowa Transportation Center, which led Iowa LTAP and the first UTC grant, to the Center for Transportation Research and Education (CTRE), which aggressively built additional centers of expertise and today coalesces around safety-related activities, to today’s Institute for Transportation. As a university institute, InTrans maintains its various programs’ flexibility and quick-response capabilities while maximizing their collective strengths in longer-term research projects of national and international significance.

**Resources**

In terms of annual funding and expenditures, InTrans ranks about seventh among transportation research institutes and centers in the United States. Federally sponsored activities now account for almost half its budget, as shown below.

The institute employs approximately 45 full-time professional, scientific, and support staff and provides support for eight ISU faculty affiliates.

InTrans is housed in a 25,000 square-foot office facility in the ISU Research Park about a mile south of ISU’s central campus and the Iowa DOT’s main offices.

Through its centers and programs, InTrans manages two materials research laboratories at ISU, a mobile mini driver-simulation laboratory housed in a quarter-cab trailer, a mobile video lab, and two full-sized mobile research laboratories for field work at construction sites.
Effective transportation-related education extends from elementary school to the university and beyond.

Educating tomorrow’s workforce is central to helping the transportation community move forward to meet tomorrow’s needs. InTrans is involved in transportation education at every level:

- Leads innovative activities to attract young people to academic programs and careers in transportation.
- Supports and mentors students in a variety of disciplines.
- Helps set the national agenda for preparing tomorrow’s transportation workforce.

K–12 Recruitment

The transportation community faces tough competition in attracting stellar young people. Through several initiatives, InTrans is sparking interest in transportation careers:

**Middle School Day**

The Transportation Student Association provides information and activities related to transportation careers at ISU’s annual Middle School Day on campus.

**Go! / ¡Vamos!**

With support from the Midwest Transportation Consortium (MTC) and the FHWA’s Eisenhower program, InTrans produces the online magazine Go! and its sister Spanish publication ¡Vamos! Together, these innovative e-resources show and tell the story of transportation to middle and high school students through interactive activities, fun articles and games, social networking, and blogs. Content is planned and developed by young people, for young people. See page 21.

**Road Less Traveled**

MTC Director Shauna Hallmark and graduate students led a career track in civil engineering during ISU’s annual Program for Women in Science–sponsored career day, the Road Less Traveled.

**Laboratory Tours**

Bob Steffes, manager of ISU’s concrete materials laboratory, regularly introduces groups of elementary and middle school students to the materials and chemistry involved in creating concrete pavements.

**LEGO® League**

Tom McDonald, MTC outreach liaison, served as an advisor for a LEGO® League team in fall 2009, when the national competition theme was transportation. The fifth and sixth grade students from the Des Moines, Iowa, area were sponsored by LEGO®, Rockwell Collins, and ISU.

**Introducing Young Women to Research**

MTC Director Shauna Hallmark led a research project comparing fuel consumption/costs and pollutant levels of two hybrid-electric school buses with the levels of control (conventional diesel) buses on similar school routes in Iowa. She used the project to introduce her Cadet Girl Scout troop to transportation-related research. The young women determined and compared the amount of fuel consumed getting to school in their parents’ car versus, in a hybrid-electric school bus and in a regular (conventional diesel) school bus. The scouts were able to use the project to complete their Silver Awards, and Hallmark used their work in her Road Less Traveled activities.
Academic Activities
A cornerstone of InTrans’s mission is supporting students’ academic preparation for professional careers. Every semester InTrans sponsors up to 85 graduate and undergraduate students through research assistants or hourly employment. These students represent many disciplines: civil, construction, and environmental engineering; community and regional planning; human-computer interaction; statistics; communications; geography; etc. InTrans provides these students with the following resources.

Tom Maze Transportation Seminar Series
Each spring semester, the MTC organizes a weekly seminar featuring industry and public agency speakers. These professionals provide a broad picture of transportation issues and careers and interact with students about their research and professional goals. A highlight in spring 2011 was a talk on national transportation policy by Peter Appel, RITA administrator, U.S. DOT. See presentations online, www.intrans.iastate.edu/mtc/education.cfm#edu_sectr.

Peter Appel Visits InTrans
On April 8, 2011, Peter Appel, administrator of the U.S. DOT’s Research and Innovative Technology Administration (RITA) (on right, above) spoke at the Tom Maze Transportation Seminar about national transportation policies and priorities.

In addition to his presentation, Appel met with several students about their research. He also toured InTrans’s facilities and took a turn at the wheel of its mobile driving simulator, the MiniCYm.

Appel said he was impressed by “the passion that so many . . . students and faculty exhibited toward advancing research in transportation safety,” as well as the “insight and academic rigor” with which students are approaching their research projects.
Transportation Student Association (TSA)

The multidisciplinary TSA serves as the student chapters of both the Institute for Transportation Engineers (ITE) and the Intelligent Transportation Society of America (ITS/A). Led by member-officers under the guidance of Nadia Gkritza, faculty advisor and InTrans engineer, the TSA nurtures members’ professional development and attracts both undergraduate and graduate students to transportation-related academic and professional careers.

The TSA is a particularly active student organization, planning and implementing activities as diverse as hosting monthly speakers from around the country to working with middle school students to monthly social events. More information is online, www.stuorg.iastate.edu/transa.

Interdisciplinary Transportation Degree

Transportation is inherently interdisciplinary, and by far the majority of students supported by InTrans are pursuing the interdisciplinary M.S. degree in transportation.

Students enrolled in this degree program develop a strong core of expertise in transportation engineering, community and regional planning, and transportation and logistics, involving work in three colleges.

Then, with an academic advisor, students supplement the core program with an individualized set of courses in fields as varied as economics, political science, industrial engineering, sociology, and other disciplines. More information is online, www.intrans.iastate.edu/mstrans/.

Student Mentoring

A new mentoring initiative has been implemented by David White, director of the Center for Earthworks Engineering Research (CEER), to improve graduate students’ technical communications skills. Christianna White, a technical writing consultant, was hired on a post-doc appointment to develop engineering communications–focused resources and to mentor students one-on-one. Due to the success of this initiative, it is being expanded to students in other InTrans centers and programs and includes a series of group coaching sessions on writing research reports, theses, and doctoral dissertations.

Collaborative Workforce Development

InTrans partners with the Iowa DOT, FHWA, other university-based transportation centers, and several private associations to ensure that today’s and tomorrow’s transportation workforce has the knowledge and skills to meet the increasingly complex challenges of the twenty-first century. Recent activities include the following:

Regional Workforce Development Summit


National Workforce Development Efforts

InTrans Director Shashi Nambisan and MTC Program Coordinator Chris Albrecht are part of the planning team for a national summit to consolidate findings from regional events into a long-term workforce development plan of action.
Student Recognitions

Students associated with InTrans are regularly recognized for the extent and excellence of their activities. Following are recent examples:

**Transportation Student Association (TSA)**

- **Jian Gao**
  - Dwight D. Eisenhower Fellowship, U.S. DOT

- **Eirini Kastrouni**
  - MOVITE’s 2011 Jan Kibbe Student Scholarship
  - MOVITE’s Thomas J. Seburn Award

- **Steven Lavrenz**
  - Outstanding Member 2010–2011, ISU’s Engineering Student Council
  - Dwight D. Eisenhower Fellowship, U.S. DOT

- **Nicole Oneyear**
  - Dwight D. Eisenhower Fellowship, U.S. DOT
  - Winner, 2011 Student Poster Contest, Midwest Institute of Transportation Engineers

- **Ellen Provorse**
  - Undergraduate Student Marshall for the College of Liberal Arts and Sciences

- **Aikaterini (Catherine) Rentziou**
  - Transportation Research Board travel grant (one of six competitive)
  - 2010 ISU Research Excellence Award

- **Gilson Lomboy**
  - 2011 International Road Federation (IRF) Road Scholar
  - Program Participant (competitive selection)

- **Katie Mauer**
  - $1,000 scholarship, University of Minnesota’s ITS Institute competition

- **Bennett Stone**
  - Dwight D. Eisenhower Fellowship, U.S. DOT

- **Teng (Alex) Wang**
  - Transportation Research Board honorarium to present paper
A reliable, safe, cost-efficient transportation system is the foundation for a robust economic recovery and sustainable prosperity. Today’s transportation challenges require looking beyond yesterday’s solutions.

Research is the engine of progress. InTrans is conducting critical research that meets immediate and future needs—like enhanced transportation sustainability—through nationally competitive project awards and local and regional partnerships.

### Federal Funding Source*

<table>
<thead>
<tr>
<th>Federal Funding Source*</th>
<th>InTrans-Managed Research*</th>
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<tbody>
<tr>
<td>National Academy of Sciences/National Cooperative Highway Research Program (NAS/NCHRP)</td>
<td>$1,200,000</td>
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<tr>
<td>NAS/Strategic Highway Research Program 2 (NAS/SHRP2)</td>
<td>$4,250,000</td>
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<tr>
<td>National Science Foundation (NSF), Emerging Frontiers on Research and Innovations (EFRI) Resilient and Sustainable Infrastructures (RESIN) program</td>
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<tr>
<td>U.S. Department of Agriculture (U.S. DOT)</td>
<td>$651,000</td>
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<tr>
<td>Federal Highway Administration (FHWA)</td>
<td>$910,000</td>
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<tr>
<td>U.S. DOT’s Research and Innovative Technology Administration (RITA) through Iowa’s Tier-One University Transportation Center (UTC), the Midwest Transportation Consortium</td>
<td>$225,000 (of $1,000,000 annual grant)</td>
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<tr>
<td>FHWA through a cooperative agreement with the CP Tech Center</td>
<td>$5,100,000</td>
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*As of June 30, 2011

### Award Success

Historically, InTrans’s strong partnership with the Iowa DOT has been reflected in a high award rate for state research funding. In fiscal years 2010–2011, InTrans continued this success.

In addition, InTrans’s award rate for federal research funding is increasing. In fiscal years 2006 through 2010, from 65 to 100 percent of competitive proposals submitted to federal agencies or federal pass-throughs by InTrans were awarded—this is a significant success rate.

At the close of InTrans’s 2011 fiscal year, a total of approximately $12.6 million in federally funded projects was under the stewardship of InTrans. (The conduct of some of these projects stretches over multiple years.) These federal funds were awarded through several national programs; see the sidebar at left.

As a result, the proportion of InTrans funding that comes from federal agencies and programs is steadily increasing. In fiscal year ending June 30, 2011, federally funded grants composed 44 percent of InTrans’s budget; see the breakdown on page 3.
Leveraging Sponsor Resources

InTrans optimizes the value of research grants by providing implementable deliverables and conducting technology transfer (see the Outreach and Technology section, beginning on page 12). In addition, InTrans locates match funding for projects sponsored by the MTC, the National Concrete Pavement Technology (CP Tech) Center’s cooperative agreement with FHWA, various pooled-fund projects, and other research activities. Such pooling of funds yields increased benefits for all sponsors.

For example, David White, director of (CEER, is leading a five-year project to enhance pavement foundations, funded through an FHWA cooperative agreement. The project is enhanced by an Iowa DOT–administered pooled fund with several states and industry that focuses on conducting field demonstrations and developing training resources, which White is also leading. These two complementary projects will yield conclusive methods and specifications for improving pavement foundation layers—far exceeding what either project could accomplish on its own.

Focus on Sustainable Transportation

The U.S. DOT has identified five high-priority goals for the U.S. transportation community:

1. Economic competitiveness (EC)
2. Environmental sustainability (ES)
3. State of good repair (GR)
4. Livable communities (LC)
5. Safety (S)

Goals 1 and 2 address two of the three generally accepted elements of a sustainable transportation system: economic and environmental vitality. Together, numbers 3, 4, and 5—condition, livability, safety—address the third requisite: social vitality.

With these ambitious goals, the U.S. DOT is raising the bar for good engineering. It is not a stretch to say that most research projects at InTrans, federally funded or otherwise, are helping to meet the challenge.

Following are a few examples, noting the primary U.S. DOT goals addressed by each project:

“Green” Asphalt with Bio-Oil
Pt: Chris Williams
Sponsors: Iowa Energy Center, Iowa DOT
U.S. DOT goal: environmental sustainability

This project incorporates bio-oil, a renewable resource, into asphalt to improve asphalt pavement’s performance and serve as a partial or even full replacement for conventional petroleum-based asphalt.

Conventional asphalt oxidizes under certain environmental conditions, causing it to get stiff, lose its elastic properties, and become more susceptible to thermal cracking. When bio-oil is incorporated into asphalt, it serves as a sacrificial oxidizer. That is, oxygen molecules target the bio-oil and age it rather than the asphalt.

In addition, adding small amounts of bio-oil to asphalt in the lab actually improves the paving material’s elastic properties. Bio-oil is harder than asphalt at low temperatures, gets softer at warmer temperatures, and when stretched returns to its original shape.

Williams is determining to what extent these characteristics make bio-oil a potential partial replacement and possibly full replacement for asphalt.
With partners in New Zealand, Scotland, and Canada, this project is thoroughly analyzing international project management approaches and, based on best practices, developing a guide and workshop materials for conducting training in effective project management strategies.

Implementing and Evaluating Smart Timber Bridge Concepts, Including Nanotechnologies, for Continuous Assessment of Condition

PI: Terry Wipf
Sponsor: U.S. Department of Agriculture, Forest Service Laboratory
U.S. DOT goals: state of good repair, economic competitiveness, safety

This project is implementing separately developed concepts and technologies related to construction of a smart timber bridge that has the capabilities to automatically report changes in its condition as they occur to facilitate timely repair or maintenance, improving safety and overall bridge economy.

The information will be available via an interactive website.

Geotechnical Solutions for Soil Improvement, Rapid Embankment Construction, and Pavement Platform Stabilization

PI: Vern Schaefer
Sponsor: NAS/Strategic Highway Research Program 2 (SHRP2)
U.S. DOT goals: economic competitiveness, state of good repair

This project is facilitating rapid highway renewal by identifying alternative materials and systems for constructing embankments and roadways over unfavorable ground conditions.

It is developing design guidelines, procedures, and QA/QC test procedures for construction of ground improvements, as well as performance-based construction specifications for selected soil improvement technologies, and determining which existing and emerging technologies offer promise for treating areas of unfavorable subsurface conditions.

The information will be available via an interactive website.

Project Management Strategies for Complex Projects

PI: Jennifer Shane
Sponsor: NAS/National Cooperative Highway Research Program (NCHRP)
U.S. DOT goal: economic competitiveness

NETSCORE-21

PI: Nadia Gkritza (one of six at ISU)
Sponsor: National Science Foundation (NSF)
U.S. DOT goals: environmental sustainability, economic competitiveness

Most U.S. energy usage is for electricity production and vehicle transportation—two interdependent, critical national infrastructures. These interdependencies will increase rapidly as hybrid electric transportation systems, including plug-in vehicles and electric trains, become more widely used.

The goal of the four-year research project—the 21st Century National Energy and Transportation Infrastructures Balancing Sustainability, Costs, and Resiliency (NETSCORE-21) project—is to formulate optimal infrastructure designs in terms of future power generation technologies, energy transport and storage, and hybrid-electric transportation systems that balance sustainability, costs, and resiliency.
Developing a Lab Test to Determine Initial Retroreflectivity Level of Glass Beads in Pavement

PI: Omar Smadi
Sponsor: NAS/NCHRP
U.S. DOT goals: safety, state of good repair

The objective of this research is to develop a recommended laboratory test for predicting the initial retroreflectivity of pavement markings in the field based on the quality of the glass beads. The test shall be rapid, repeatable, reproducible, cost-effective, practical, and verified and validated through measurements of the initial retroreflectivity of pavement markings applied in the field.

Food Product Demand Mapping

PI: Randy Boeckenstedt
Sponsors: ISU’s Leopold Center for Sustainable Agriculture, Iowa DOT
U.S. DOT goals: environmental sustainability, economic competitiveness, livable communities

This project is refining a beta version of the Iowa Produce Market Potential Calculator, developed by InTrans, developing it into an interactive web-based tool that maps distances between produce production and potential markets.

Implementation of Concrete Pavement Tire-Pavement Noise Program

PI: Paul Wiegand,
Sponsors: FHWA, Iowa DOT
U.S. DOT goal: livable communities

This project fully implements a concrete pavement surface characteristics program to significantly reduce tire-pavement noise. Activities include:

• Continuing comprehensive time, history, and noise data collection on new and existing pavements;
• Analyzing the data to identify clear relationships between texture, noise, friction, etc.;
• Developing and evaluating construction specifications of conventional texture techniques including grinding; and
• Developing and evaluating innovative construction techniques that have the potential to significantly reduce noise.

Sustainable Concrete Pavements: Manual of Practice

PI: Peter Taylor
Sponsor: FHWA
U.S. DOT goals: environmental sustainability, economic competitiveness, state of good repair

This project is facilitating the construction of sustainable concrete pavements by developing a manual of practice that incorporates research related to sustainable pavement materials, design, mixture design, construction, and quality assurance and quality control. The manual will be a major product of the Sustainability Track (Track 13) of the Long-Term Plan for Concrete Pavement Research and Technology.

Evaluation of Speed Activated Displays on Curves

PI: Shauna Hallmark
Sponsor: FHWA
U.S. DOT goal: safety

Researchers are conducting a national field evaluation of low-cost dynamic speed signs on rural roadways in at least six states. The goal is to provide traffic safety engineers and other professionals with additional tools to manage speeds and decrease crashes on horizontal curves on rural roadways.
Outreach and Technology Transfer: Highlights

The typical 10-year lag time between development and implementation of new transportation solutions must be radically reduced.

To do so, InTrans deploys a host of outreach and technology transfer strategies:

**Training Events**

InTrans and its centers and programs organize and/or host well over 125 conferences, workshops, and webinars annually with upwards of 3,500 participants. Following are recent highlights:

**Preparing Tomorrow’s Transportation Workforce**

InTrans hosted a two-day regional workforce development summit as part of an FHWA-sponsored national effort. Participants—university educators and students, state agency human resources personnel and staff at all levels, adult education experts, and transportation-related industry representatives—assessed the educational and training needs of the transportation workforce and identified best practices to address those needs. The report is online, www.intrans.iastate.edu/mtc/documents/2010MidwestSummitReport.pdf.

**Human Factors Workshop**

This Iowa DOT workshop, hosted by the University of Iowa and co-sponsored by InTrans and the MTC, was a working event to identify and prioritize research needs in human factors and safety. Attendees from the Iowa DOT, FHWA, the three Iowa regent universities, local governments, professional associations, driver education associations, and neighboring state departments of transportation actively participated in focus groups. The top 25 research concepts can be found on the Iowa DOT’s website, www.iowadot.gov/research/human_factors.htm.
Mid-Continent Transportation Research Symposium
InTrans alternates with the University of Wisconsin-Madison’s Midwest Regional UTC in hosting the annual Mid-Continent Transportation Research Symposium, providing a Midwestern venue and a TRB-like format. The most recent symposium held at ISU attracted more than 400 participants. Proceedings and presentations are online, www.intrans.iastate.edu/pubs/midcon2009/index.htm, www.intrans.iastate.edu/pubs/midcon2009/index_presentations.htm.

Smart Work Zone Deployment Initiative (SWZDI) Webinar
InTrans and the FHWA, Iowa Division, organized and hosted a national webinar for the Smart Work Zone Deployment Initiative pooled fund study. Replacing conferences held every few years, the cost-effective webinar format made it possible for a broad national audience to learn about the work accomplished under the initiative. Approximately 110 participants from many agencies in several states participated.

Online Public Employees Leadership Institute
This new program, certified by the American Public Works Association, offers 14 online self-study modules to help public and private employees develop the knowledge and skills they need to move into supervisory and leadership positions. See www.intrans.iastate.edu/ltap/leadershipinstitute/.

Built-in Project Implementation
Perhaps the fastest way to move research results into practice is to build implementation strategies right into research projects. Many InTrans projects include field demonstrations that allow agencies to field-test potential solutions and contribute lessons learned to the project outcomes. Other projects include deliverables such as workshops, manuals, guidelines, surveys of best practices, technical notes, etc.

To help ensure that InTrans research includes implementation, almost every project has an active, diverse advisory committee of technical experts. Members help focus the work and act as champions within their organizations, often hosting demonstration projects or other training events, reviewing training materials or other written resources, and teaching workshops.

Outreach-focused Projects
Several funded projects at InTrans focus entirely on implementing new solutions. Following are four examples:

Concrete Pavement Overlays
Concrete overlays are versatile, sustainable, cost-effective pavement repair/rehabilitation solutions in which the original pavement—either concrete or asphalt—continues to contribute value to the pavement system. To help agencies, consultants, and construction contractors implement these underutilized solutions, the National CP Tech Center is leading an intensive, multi-year information and training campaign.

After conducting several workshops and organizing more than 15 demonstration projects around the country in recent years, the center is now developing its third edition of a popular handbook and a new overlay design guide, both of which will be the bases for a new round of training.

This extensive initiative has been supported by FHWA, several state concrete pavement associations, and the American Concrete Pavement Association.
Mapping Services for U.S. Road Assessment Program (usRAP)

Providing accessible, risk-based safety data to agency decision makers is a primary objective of the AAA Foundation for Traffic Safety (AAAFTS) usRAP pilot program. Led by Reg Souleyrette, Gerald and Audrey Olson Professor in Civil Engineering, and Zach Hans, research engineer, InTrans is a technical partner to the Midwest Research Institute (MRI) in the program. The MRI acts as liaison to eight participating highway agencies, including Iowa, while InTrans focuses on mapping crash and other safety data for the pilot states or, where data are not available, reducing video into data and then creating maps. The risk maps identify, for example, road segments that could benefit from safety features. Souleyrette and Hans have also been instrumental in creating maps for countries in Latin America through the International Road Assessment Program (iRAP).

Tag-Teaming to Get a “Safety Edge”

A noteworthy example of project-level technology transfer and cross-program collaboration is a project led by Shauna Hallmark, director of the MTC, through InTrans’s Center for Transportation Research and Education (CTRE). The project examined the effectiveness of Iowa’s local-roads applications of the FHWA’s Safety Edge as a low-cost safety enhancement. Several county paving projects incorporating the Safety Edge were constructed in 2008–2010. Before and during construction, Hallmark’s research team provided technical assistance, plan notes and specifications, and the loan of special equipment and organized demonstration open houses. The team then partnered with Keith Knapp, director of InTrans’s Local Technical Assistance Program (LTAP), to develop and distribute educational materials based on lessons learned.

Heartland Highway Corridor Management Agreement

Through a contract with the Iowa DOT, Chris Albrecht, MTC program coordinator, serves as a statewide resource for applications of access-management–related research results. He serves in a general advisory role to the Iowa DOT and, specifically, provides information and resources to stakeholders along southeast Iowa’s Heartland Highway Corridor.

Mobile Labs

Both the National Center for Concrete Pavement Technology (CP Tech Center) and CEER own mobile laboratories that travel to sites across the country to assist with quality assurance testing and various demonstration projects. They are tractor-trailer units with state-of-the-art equipment funded with the help of industry partners. The mobile concrete lab alone has clocked close to 30,000 miles in almost 30 states, helping pavement owners and contractors improve their construction and testing processes.

Online Outreach

InTrans publishes abstracts of current research projects on its website and in the Transportation Research Board’s Research-in-Progress (RiP) online database. As projects are completed, final reports, brief technical summaries, and any other print deliverables are published on InTrans’s website and reports are added to TRB’s Transportation Research Information Service (TRIS).

Several InTrans programs distribute web-based newsletters that provide research project summaries. The CP Tech Center publishes bi-monthly electronic digests of its own and national research results related to the various research tracks of the national Long-Term Plan for Concrete Pavement Research and Technology (CP Road Map), which the center administers.

InTrans is in the process of compiling a searchable online catalog of all its online technology transfer resources, similar to one developed by the CP Tech Center, www.cptechcenter.org/pubsinterface/.

In addition, InTrans is revamping its web-based Master Outreach Records System (MORS) to improve online registration for events, update contact information, and help users target audiences more accurately.
In addition to InTrans’s work with iRAP (see previous page), several InTrans personnel are involved in international research and technology transfer activities. Following are some recent examples:

- **Omar Smadi, Neal Hawkins: Florianópolis, Brazil**
  
  Presentation at CBR&C 09/BRASVIAS Conference: Pavement marking technologies—applied strategies and solutions

- **Omar Smadi, Neal Hawkins: Dubai, United Arab Emirates**
  
  Presentation at Gulf Traffic Exposition: Asset management principles

- **Dan Gieseman: Alberta, Canada**
  
  Workshop and presentation at 2nd International Conference on Urban Traffic Safety: Spatial analysis and visualization of traffic safety data

- **Reg Souleyrette: Europe, Taiwan, and China**
  
  Scanning tour: Seeking first-hand knowledge of state-of-the-art European and Asian rail systems to use in ISU undergrad courses on railroad planning and design

- **Shashi Nambisan: New Delhi and Patna, India**
  
  Scanning tour/TRB delegation: Seeking bilateral collaboration and cooperation opportunities with transportation-related ministries

- **Sri Srithran: Christchurch, New Zealand**
  
  Scanning team from the Earthquake Engineering Research Institute: Studying the earthquake’s impacts on buildings, roadways, bridges, and traffic
Centers and Programs

Grantors and other sponsors benefit from the broad variety of research and outreach expertise and capabilities under the umbrella of InTrans.

On the following pages are brief summaries of the centers and programs at InTrans. Each initiative represents a unique sphere of transportation expertise and capabilities. Together they represent the gamut of expertise from infrastructure, to technology and systems, to planning and policy.

Yet, InTrans is more than a sum of its parts. All of its centers and programs share physical space, core staff, communications services, and administrative resources, as well as access to the variety of multidisciplinary experts, facilities, etc., at ISU and the Iowa DOT. Each center/program benefits from the proximity and complementary expertise of the others.

The resulting synergy naturally leads to cross-program collaborations. For example, staff in the CMAT program regularly provide construction expertise for many types of projects at InTrans. CMAT researchers

- Are working with the BEC to evaluate alternatives for accelerating construction of freeway bridges.
- Contribute construction expertise to many projects led by CEER, including:
  - Use of rapid, self-contained, in-situ permeameter for field quality control of pavement base materials.
  - Enhancing embankment quality when soils are unsuitable.
  - Field evaluation of compaction monitoring technology.

Another program, the Statewide Urban Design and Specifications (SUDAS), uniquely benefits from its affiliations with other InTrans groups, collaborating with them to address specific SUDAS-related issues and regularly incorporating their research results into its designs and specifications. Examples include

- Designs for concrete overlays (CP Tech Center research)
- Best practices and applications of trenchless technologies for pavement construction and utility work (documented by CMAT)
- Subbase and subgrade design and construction techniques (developed in conjunction with CEER)
- Traffic signal design and specifications (developed in conjunction with CTRE)

Cross-program activities like these are common at InTrans. Research sponsors benefit from the broad variety of capabilities under the umbrella of InTrans.
**BRIDGE ENGINEERING CENTER**

Conducting research to solve real-world structural challenges

**Specialties**
- Administering the National Center for Wood in Transportation Structures
- Improving structures’ durability with accelerated construction and advanced materials
- Monitoring bridges with high-tech remote sensing equipment
- Designing and evaluating timber bridges

**Major partners**
- Iowa DOT, Office of Bridges and Structures
- USDA Forest Service/Forest Products Laboratory
- FHWA
- National Park Service
- Transportation Research Board
- Industry

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www.bec.iastate.edu  
www.woodcenter.org

Brent Phares, Associate Director  
515.294.5879  
bphares@iastate.edu

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**CENTER FOR EARTHWORKS ENGINEERING RESEARCH (CEER)**

Solving geotechnical engineering and earthworks construction challenges with innovative technologies and systems

**Specialties**
- Improving efficiency in earthworks construction
- Ensuring long-term serviceability of civil infrastructure
- Protecting earthworks projects from natural hazards
- Respecting the environment in geotechnical engineering and earthworks projects
- Creating knowledge regarding rapid earth material selection and processing, intelligent construction systems, ground improvement technologies and equipment, and soil stabilization

**Major partners**
- Iowa DOT
- FHWA
- Industry
- Other state DOTs
- Iowa Highway Research Board
- National Academy of Sciences

David J. White, Director  
515.294.1463  
djwhite@iastate.edu  
www.eerc.iastate.edu
Managing InTrans’s historically core areas of expertise in transportation safety and transportation planning

Neal Hawkins, Director  
515-294-7733  
hawkins@iastate.edu  
www.ctre.iastate.edu

Specialties
• Planning, design, and operations of transportation facilities
• Safety
• Asset management
• Sustainable transportation systems
• Transportation economics
• GIS tools

Managing InTrans’s historically core areas of expertise in transportation safety and transportation planning

Neal Hawkins, Director  
515-294-7733  
hawkins@iastate.edu  
www.ctre.iastate.edu

Specialties
• Planning, design, and operations of transportation facilities
• Safety
• Asset management
• Sustainable transportation systems
• Transportation economics
• GIS tools

Several long-term programs, described briefly below, focus on one or more of CTRE’s specialties. Together with CTRE, these programs comprise a powerhouse of transportation safety and sustainability–related expertise:

Aurora
CTRE provides administrative and outreach support for this FHWA pooled fund to identify, prioritize, and conduct research regarding the use of road weather information systems (RWIS) to mitigate weather-related transportation challenges.

Center for Weather Impacts on Mobility and Safety
CWIMS studies ways to improve traveler safety when weather affects transportation systems.

Geographic Safety Information Systems Program
The GSISP develops premier safety data analysis and visualization tools.

Iowa Traffic Safety Data Service
This free crash data analysis and mapping service serves Iowa organizations that want to support decisions with data and/or to present data in easily understood formats.

Major partners
• Iowa DOT
• Cities and counties in Iowa
• Minnesota DOT
• U.S. DOT
• NCHRP
• SHRP2
• FHWA
• U.S. EPA
• National Model/TraCS
• Iowa Governor’s Traffic Safety Bureau
• Industry

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Roadway Infrastructure Management and Operations Program (RIMOS)
RIMOS develops practical tools to help agencies analyze data about infrastructure (pavements, structures, markings, traffic control devices) and allocate scarce resources cost effectively for maintenance and improvements.

Smart Work Zone Deployment Initiative
CTRE administers this four-state pooled-fund project (FHWA Transportation Pooled Fund Program, TPF-5(08)) that is investigating better ways of controlling traffic through work zones.

Sustainable Transportation Systems Program
Developing tools and conducting research related to non-infrastructure methods and systems for improving transportation system sustainability.
Researching innovative construction technologies and processes for the transportation industry

Jennifer Shane, Director  
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Specialties
• Improving cost estimating, scheduling, and decision-making tools and strategies  
• Researching and developing best practice tools and guidelines for project management, including complex projects and nighttime projects  
• Providing construction expertise on other programs’ research projects  
• Educating the next generation of construction engineers

Major partners
• Iowa DOT  
• Minnesota DOT  
• AASHTO  
• FHWA  
• NCHRP  
• SHRP2

Iowa LTAP
Local Technical Assistance Program

Helping Iowa’s local governments keep up with growing transportation demands by implementing best practices and technologies

Keith Knapp, Director  
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kknapp@iastate.edu  
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Specialties
• Training local street and road crews and supervisors through workshops, webinars, a quarterly publication Technology News, publications and DVDs in the Stan Ring Memorial Library, technical assistance and referrals, and other resources  
• Managing the Roads Scholar Program and the Public Employees Leadership Institute, which provide structured curricula for professional development  
• Offering a safety circuit rider and local roads safety liaison program to provide in-house training and assistance  
• Conducting research and sharing knowledge based on that research

Major partners
FHWA  
Iowa DOT  
Iowa Highway Research Board  
ISU Extension to Communities
Serving as the national university-based hub for concrete pavement research and technology transfer

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www.InTrans.iastate.edu/asphalt

Peter Taylor, Associate Director  
515-294-9333  
ptaylor@iastate.edu

Specialties
• Improving pavement design, mix and materials, construction, maintenance, and renewal science and technology to produce durable, cost-effective concrete pavements
• Bringing stakeholders together to identify, prioritize, and fund critical research and technology transfer
• Managing administrative and communications support for the national Long-Term Plan for Concrete Pavements (the CP Road Map)
• Sharing information with people who can use it, through targeted training events and resources
• Preparing the next generation of concrete pavement professionals

Major partners
• Iowa DOT
• Iowa Highway Research Board
• FHWA
• Many state departments of transportation
• American Concrete Pavement Association, Iowa Concrete Paving Association, Concrete Reinforcing Steel Institute, Portland Cement Association, and other industry partners

Center for Nanotechnology in Cementitious Systems

Taking a multi-disciplinary approach to concrete materials science, technology, and engineering

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www.InTrans.iastate.edu/cncs

Peter Taylor, Co-director  
515.294.9333  
ptaylor@iastate.edu

Specialties
• Understanding the science of cementitious materials
• Using nanotechnology to improve sustainability and performance of concrete roads and structures

Major partners
FHWA
Introducing young people to transportation careers via electronic media

Rema Nilakanta, Go! Coordinator
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www.go-explore-trans.org/go/gonew/

Go! magazine (and its sister Spanish e-publication, ¡Vamos!) is a dynamic online magazine for students ages 13 to 19. Through interactive articles, games and puzzles, multimedia presentations and activities, and contests, Go! introduces young people to the world of transportation and the variety of challenging and rewarding career options related to transportation.

Go! covers transportation from all angles, from infrastructure to vehicles to the people behind the wheel—whether that wheel is on a car, truck, train, plane, or ship. Most of the content is researched and written by ISU students studying communications (English and Spanish), human-computer interaction, and engineering.

Go! is partnering with public schools to provide teaching modules that complement and enhance the schools’ curricula with real-world transportation challenges, with a special emphasis on STEM (science, technology, engineering, and mathematics) content. Go! will soon unveil a user-friendly database of transportation career descriptions and related academic programs at universities and technical schools.

Now in its fifth year, this experimental project is supported by the MTC and FHWA.

Improving asphalt through research, sharing research results to effect changes in practice, and educating students

Chris Williams, Director
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rwilliam@iastate.edu
www.InTrans.iastate.edu/asphalt

Specialties
• Improving asphalt materials and pavements through research and tech transfer
• Evaluating asphalt testing procedures
• Investigating “green” asphalt solutions
• Developing students’ technical skills in asphalt

Major partners
• Iowa Highway Research Board
• FHWA
• Asphalt Paving Association of Iowa
• National Asphalt Paving Association
• Center for Sustainable Environmental Technology
• Bioeconomy Institute, ISU
• Grain Processing Corporation
• SEM Materials
• State departments of transportation in Iowa, Michigan, Minnesota, Missouri, and Wisconsin
**Enhancing transportation safety through improvements in management information systems**

Shauna Hallmark, Director  
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shallmar@iastate.edu  
www.InTrans.iastate.edu/mtc

**Specialties**
- Educating the next generation of transportation professionals; MTC takes the lead in organizing the annual seminar series and student mentoring activities described on pages 5 and 6
- Improving traffic safety through research in management information systems and human factors

**Major partners**
- U.S. DOT (the MTC is a Tier 1 University Transportation Center)
- Iowa DOT
- AAA Foundation for Traffic Safety

**Providing uniform design guidelines and construction specifications for Iowa’s urban public improvement projects**

Paul Wiegand, Director  
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www.iowasudas.org

**Specialties**
- Developing and updating a statewide urban design manual in 13 topic areas, including lighting, erosion control, utilities, stormwater management, etc.
- Developing and maintaining quality construction specifications in one manual for contractors in 11 topic areas, including sewers and drains, streets, traffic signals, site landscaping, etc.

**Major partners**
- Iowa DOT
- Committees whose volunteer members represent city and county agency engineers, contractors, suppliers, industry, and consultants in Iowa

**MTC**
**MIDWEST TRANSPORTATION CONSORTIUM**
Excellence

In general, the centers and programs at InTrans fulfill their mission of transportation-related research, education, and outreach with funding from competitively won research and/or technology transfer projects. Historically, most activities conducted at InTrans are sponsored by federal, state, and local transportation agencies, and the proportion of federal public research monies under the stewardship of InTrans is steadily increasing.

During fiscal years 2010 and 2011, InTrans completed almost 40 individual research projects while providing ongoing services and programs, and ended this period with more than two dozen projects in the works and several additional proposals pending.

Funds for these projects were awarded through diverse organizations and programs, including the following:

- Iowa DOT
- Iowa Highway Research Board (IHRB)
- National Academies of Science/National Cooperative Highway Research Program (NAS/NCHRP)
- NAS/Strategic Highway Research Program (NAS/SHRP2)
- National Science Foundation, Emerging Frontiers on Research and Innovations (EFRI) Resilient and Sustainable Infrastructures (RESIN) program
- U.S. Department of Agriculture (USDA)
- FHWA (including support for the CP Tech Center through a multi-year cooperative agreement)
- U.S. DOT’s Research and Innovative Technology Administration (RITA) (support for the MTC, a Tier One University Transportation Center)

Information about these projects, including final reports and technical summaries of completed projects, can be found on the InTrans website, www.intrans.iastate.edu.