During 2012, IDOT and the Missouri Department of Transportation continued work on the Illinois tower for what will be the new bridge for I-70 into St. Louis.
Director’s Message
ICT Director Imad Al-Qadi summarizes fiscal year 2012 and how ICT’s research continues to impact the nation and world.

Secretary’s Message
IDOT Secretary Ann Schneider discusses ICT’s prominent role in IDOT’s research process and technology transfer.

ICT at a Glance
From ICT’s staff and facilities to its continued growth, this section highlights key information about ICT’s impact on transportation research.

ICT Sponsors and Research Process
ICT conducts research on behalf of several state and national agencies. This section shows how ICT research is administered and how a project moves from inception to implementation.

ICT Growth
ICT continues to expand the universities and institutions it partners with, the number of affiliated researchers and students, and the recognition its projects receive.

Investigators
ICT’s investigators include an array of distinguished researchers from various universities, private organizations, and government agencies.

ICT Faculty and Student News
In FY2012, many ICT researchers and students were appointed to new positions and received various honors.

Technology Transfer
ICT actively disseminates research findings through its website, national databases, social media, publications, presentations, events, conferences, short courses, and webinars.

ICT’s Research
The transportation research at ICT is diverse. This section highlights ICT’s fiscal year 2012 activity in the following research areas:
- Construction
- Environment
- Pavement Design and Management/Materials
- Planning
- Public and Intermodal Transportation
- Safety Engineering
- Structures/Hydraulics/Geotechnical
- Traffic Operations and Roadside Maintenance

Project Listings
This section provides details on all active projects for 2012, as well as previously completed research.
The Illinois Center for Transportation (ICT) has experienced tremendous growth since it began in 2005. We started as a team of transportation researchers and students within the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign and have rapidly grown to include over 100 researchers, 175 graduate students, and several undergraduate students representing many campus units and 14 different universities across a wide range of disciplines. In large part, our growth has stemmed from our commitment to our core values: collaboration, innovation, and education.

Collaboration has always been at the heart of what ICT does. Our research agreement with the Illinois Department of Transportation (IDOT) creates a unique partnership to advance the transportation systems in Illinois, the country, and the world. This year, ICT and IDOT extended their partnership to continue groundbreaking, innovative, and easily implemented research through 2016. ICT’s collaborative spirit reaches beyond our partnership with IDOT. We have reached out to involve many University of Illinois at Urbana-Champaign departments and the Chicago and Springfield campuses, as well as partnering with other universities through ICT/IDOT-awarded projects. Our request for proposal process ensures our projects are led by the top researchers in each field of study. Additionally, ICT conducts research for numerous other government and non-government agencies, such as the Illinois Tollway, the National Science Foundation, state and province Departments of Transportation, the Federal Highway Administration, Federal Aviation Administration, as well as major industry and national and international research groups.

Innovation is made possible because of the high quality of ICT researchers, graduate students, and undergraduate students. ICT researchers are world-renowned, as evidenced by the recognition our investigators receive, the offers of employment our students enjoy, and the far-reaching impacts of our research.

Innovation is made possible because of the high quality of ICT researchers, graduate students, and undergraduate students. ICT researchers are world-renowned, as evidenced by the recognition our investigators receive, the offers of employment our students enjoy, and the far-reaching impacts of our research. As you will see throughout this annual progress report, we strive to conduct groundbreaking research that will make our highway system safer, more sustainable and environmentally friendly, while saving IDOT, other agencies, industry, and, most importantly, the taxpayers of Illinois, money.

Education is the foundation for everything we do. ICT faculty strive to give our students the best possible education experiences so that they can continue the tradition of professional excellence. But our research cannot exist in a vacuum and is only useful when it is put into action. Hence, we place a strong emphasis on technology transfer. Each year, we offer numerous workshops, courses, and conferences to ensure Illinois engineers, contractors, and consultants have the knowledge they need to make the best decisions to move Illinois’ and the nation’s transportation networks forward. We also proactively develop new standards and guidelines. This year, I am especially pleased that our classroom in the Advanced Transportation and Research Engineering Laboratory (ATREL) has been equipped with distance learning technology. We began offering live webinars, broadcasting our workshops and courses throughout the state and world, and recording lectures for later viewing on our website.

I am pleased to present the highlights of fiscal year 2012 in this report. For updates throughout the year, please visit our website (ict.illinois.edu), which is regularly updated with announcements, RFPs, project final reports, bi-monthly project spotlights, and research project progress.

Sincerely,

Imad L. Al-Qadi, PhD, PE, Dist.M.ASCE Founder Professor of Engineering Director, ICT and ATREL University of Illinois at Urbana-Champaign
Collaborating with the University of Illinois at Urbana-Champaign to create the Illinois Center for Transportation (ICT) has been of great value to the Illinois Department of Transportation (IDOT). This partnership allows IDOT to spend our federal State Planning and Research funds wisely by leveraging our dollars with ICT’s help. Our collaboration has resulted in a research program that is responsive to IDOT’s needs. IDOT staff is involved with the research process every step of the way—from identifying research needs and selecting researchers, to working with researchers to produce usable answers to our most pressing needs, and finally, to implementing practical results. The projects highlighted in this report show the diversity and depth of the research done at ICT and illustrate how IDOT, the nation, and most of all, the citizens of Illinois, have benefited from these innovations. ICT is helping IDOT provide safe, cost-effective transportation for Illinois while enhancing quality of life, promoting economic prosperity, and demonstrating respect for our environment.

Sincerely,

Ann Schneider
Secretary, Illinois Department of Transportation

“The projects highlighted in this report highlight the diversity and depth of the research done at ICT and illustrate how IDOT, the nation, and most of all, the citizens of Illinois, have benefitted from these innovations.”

IDOT Secretary Ann Schneider, other IDOT leaders, several elected officials, and University of Illinois representatives toured ATREL in 2012 to see firsthand the research being conducted and better understand its impact for Illinois.
ICT Background
The Illinois Center for Transportation (ICT) is a premier transportation research center that builds on the experience of renowned experts in transportation and related fields at the University of Illinois, the Illinois Department of Transportation (IDOT), and other universities in Illinois and across the country by providing the appropriate tools and support required for objective research.

ICT facilitates the development and timely implementation of cost-effective technologies that improve safety and reliability, reduce congestion and impact on the environment, optimize the utilization of the state transportation infrastructure, and maximize the return on taxpayers’ dollars. ICT serves the needs of IDOT, the State of Illinois, and the nation through research, education, and outreach.

ICT is headquartered at the Advanced Transportation Research and Engineering Laboratory (ATREL), one of the top transportation research facilities in the nation, located on 47 acres of the former Chanute Air Force Base in Rantoul, Illinois. The facility has 67,000 square feet of laboratories and three major buildings for testing pavement materials and transportation operations. The large land area at the ATREL complex houses a full-scale pavement testing facility equipped with an Accelerated Transportation Loading Assembly (ATLAS), capable of evaluating multiple transportation support systems under real environmental and vehicular loading conditions.

Research Diversity
Since ICT began, the breadth and depth of the research conducted has increased dramatically. The two charts below illustrate the types of IDOT research conducted in 2005 compared with the diversity of research today.

Overview
ICT was founded in 2005 in partnership with IDOT
146 IDOT research projects approved to date
90 IDOT completed projects
14 universities have participated in ICT research projects
110 researchers have contributed research
175 graduate students, as well as numerous undergraduates, have received support
67,000 square feet of laboratory space on 47 acres
ICT’s affiliated civil engineering program is ranked #1 in the nation in graduate education and #2 in undergraduate education
AASHTO AMRL accreditation in 2011

Growth
Each year, ICT has experienced significant growth—in terms of the volume of IDOT projects completed, the number of researchers leading projects, and the amount of funding awarded.
ICT Staff

ICT’s professional staff provides a support structure to assist with the administration side of the research process.

Imad Al-Qadi, Founder Professor of Engineering, Department of Civil and Environmental Engineering, University of Illinois at Urbana Champaign; ICT and ATREL Director, alqadi@illinois.edu

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Mary Fries, Trainer, mjfries@illinois.edu

IDOT Administration

ICT works closely with IDOT to ensure that research meets the needs of IDOT and that each IDOT-sponsored project is making satisfactory progress. Below are the IDOT staff who work with ICT in administering IDOT research projects.

Bill Frey
Acting IDOT Director of Highways,
Executive Committee Chairman

David Lippert
Bureau Chief, Materials and Physical Research

Amy Schutzbach
Engineer of Physical Research

Megan Swanson
Technical Research Coordinator
The Advanced Transportation Research and Engineering Laboratory (ATREL) is a state-of-the-art facility located on 47 acres just 15 miles north of the University of Illinois at Urbana-Champaign campus. The complex includes 67,000 square feet of research laboratories, a distance learning/continuing education classroom, offices, a technical library, and an outdoor pavement testing facility. To sustain ICT and the University of Illinois’ research, a wide range of projects are conducted at ATREL—from basic science and theoretical research to full-scale field-testing and transportation infrastructure evaluation. ATREL is AASHTO-accredited in the categories of quality systems, hot-mix asphalt, and aggregates. ATREL laboratories house an unequaled collection of transportation research equipment, including the following:

**ATREL Main Lab/Offices**
- Several servo-hydraulic systems for soil, granular materials, concrete, and hot-mix asphalt (HMA) testing, including simple performance, complex modulus, indirect tension, creep, four-point bending fatigue, and disc-shaped compact tension, just to name a few tests.
- SuperPave™ binder testing equipment, including bending beam rheometers, dynamic shear rheometers, viscometers, rolling thin-film oven, pressure-aging vessel, extraction equipment, recently developed hot-poured sealant testing equipment, and many others.
- Granular material equipment, including triaxial shear apparatus, aggregate image analyzers, and the UI-FastCell capable of applying dynamic stresses on a soil cylinder in both vertical and radial directions.
- Several mixers for producing asphalt samples of varying size up to 12 kg, multiple gyratory compactors (including several portable), a rolling wheel compactor, a vibratory steel wheel roller, and equipment able to perform density determinations according to AASHTO specifications.
- Several hydraulic pumps including a 30 gpm hydraulic pump that can be connected to a variety of computer-controlled servo-actuators to simulate wheel loads on full-scale pavement slabs and bridge girders.
- Multiple environmental chambers coupled with testing frames for a wide range of testing conditions.
- Outside storage for construction-size aggregate stockpiles on an asphalt-paved area and indoor storage for raw aggregate stockpiles that require special handling.

**Accelerated Transportation Loading Assembly (ATLAS)**
- ATLAS can evaluate full-scale transportation systems subject to real-life traffic and environmental conditions. The system is capable of simulating aircraft, truck, or rail traffic distributions, testing all types of pavement systems, and applying load levels exceeding those of highway and airfield limits. ATLAS weighs 156 kips and is 124 feet long, 12 feet high, and 12 feet wide. Mounted on four crawler tracks, the test unit can be easily positioned on the pavement test section. ATLAS transmits loads to the pavement structure through a hydraulic ram attached to a wheel carriage, which can accommodate a single tire, dual tires, aircraft tire, or a single-axle rail bogey. ATLAS has been adapted to include a portable structure that allows control of daily temperature changes on the pavement section being studied. ATLAS also has readily available data acquisition systems for collecting both static and dynamic data from instrumented pavement sections. ATLAS can apply up to 10,000 repetitions per day.

**Materials Processing Facility**
- A testing frame capable of evaluating fully supported slabs up to 16 feet long and 8 feet wide. This frame has been used to test reinforced concrete beams cut from interstate pavements and also to simulate fatigue in airfield concrete slabs. This setup also acts as a soils pit, allowing for multilayered systems to be tested at full-scale.
- Several large-scale permeameters for determination of hydraulic conductivity of nearly any granular material.
- A large-scale triaxial cell for advanced testing and characterization of railroad ballast materials with specimens up to 12 inch diameter. Full-scale rail testing equipment is capable of characterizing steel rails, clips and insulators, and concrete tie pads.

**Traffic Operations Lab**
- Equipment to evaluate traffic signal components and fiber-optic communications, including controllers, detector units, and conflict monitors. This includes multiple full-scale prototypes and reproductions of traffic signal components as well as scaled models of local roads, highway systems, and rail systems to optimize timing, etc.

**Mobile Technology**
- A van-mounted, ground penetrating radar (GPR) device with a wide range of antennae for accurate measurements of a pavement’s layer thicknesses, bridge deck assessment, railroad track evaluation, and internal flaw detection.
- State-of-the-art data acquisition systems for collecting static and dynamic information from instrumented full-scale pavement sections.
- Falling weight deflectometer (FWD) for pavement structure capacity evaluation and thickness prediction.
ICT’s primary source of support comes from Federal Highway Administration (FHWA) resources, which are administered by the Illinois Department of Transportation (IDOT). IDOT allocates funds to ICT for research, development, and technology transfer activities related to highway, public transportation, and intermodal transportation systems.

In FY 2012, ICT signed a five-year, $30 million intergovernmental agreement (IGA) with IDOT—its third consecutive IDOT IGA since ICT’s inception in 2005. Under this agreement, ICT continues to provide IDOT support to administer research projects, develop and manage technical studies, conduct research projects, and lead technology transfer programs. FHWA funds comprise $21 million of this agreement amount. The additional $9 million in matching funds to improve the state’s transportation system is provided by the University of Illinois and various research partners.

ICT has also engaged directly in research with the following organizations:

- Environmental Protection Agency
- Federal Highway Administration
- Federal Rail Association
- Federal Aviation Administration
- Illinois State Toll Highway Authority
- National Science Foundation
- Strategic Highway Research Program
- Several state DOTs
- Several major industries

Sources of Funding

ICT Research Sponsors
ICT/IDOT Executive Committee
The committee reviews and selects proposed projects that are innovative, diverse, and cost-effective and that serve the needs of the State of Illinois and IDOT. In addition to ICT/IDOT leadership, the Executive Committee includes the director of each IDOT division or his/her appointee.

Bill Frey, Acting Director of Highways, Executive Committee Chair
Imad Al-Qadi, ICT Director
Samantha Fields, Acting Director, IDOT Office of Legislative Affairs
Jeff Heck, Director, IDOT Office of Quality Compliance & Review
Matthew Hughes, Director, IDOT Office of Finance & Administration
Chuck Ingersoll, Director, IDOT Office of Planning & Programming
Jon-Paul Kohler, Manager, FHWA Planning & Program Development
Frank McNeil, Director, IDOT Office of Business & Workforce Diversity
Ellen Schanzle-Haskins, Chief Counsel, IDOT Office of Chief Counsel
Joseph Shacter, Director, IDOT Division of Public & Intermodal Transportation
Susan Shea, Director, IDOT Division of Aeronautics
John Webber, Director, IDOT Office of Communications

ICT’s IDOT Research Administration

IDOT is able to more safely work on nighttime construction projects because of project R27-2.

ICT/IDOT Administrative Committee
The committee meets monthly to discuss the status of ongoing ICT projects.

Imad Al-Qadi, ICT Director
Lori Carpenter, ICT Assistant to the Director
Dave King, ICT Senior Fiscal Operations Manager
David Lippert, Bureau Chief, IDOT Bureau of Materials and Physical Research
Andrea Ruedi, ICT Deputy Director
Amy Schutzbach, IDOT Engineer of Physical Research
Megan Swanson, IDOT Technical Research Coordinator

ICT worked with IDOT on project R27-SP18, which developed best management practices for the construction of bike trails in Illinois.
To maximize the diversity of IDOT research considered, selected, and implemented, ICT operates by the procedures outlined below.

1. Call for ideas is posted on ICT website
2. TAGs review ideas and recommend selected research projects to the ICT Executive Committee
3. Executive Committee prioritizes research projects and approves
4. Technical Review Panels (TRPs) are formed for each project to guide the research process
5. ICT appoints a Principal Investigator (PI) to lead the research project. A request for Proposal (RFP) is issued for the research project and ICT selects PI from submissions
6. TRP and PI work together to develop the project work plan
7. PI conducts research and provides quarterly reports for TRP Chair
8. Final research report is published on ICT website and Transportation Research Board database
9. IDOT implements the results of the research

Research Process: From Idea to Implementation

Technical Advisory Groups (TAGs) determine research needs
1. Call for IDOT Research Ideas
IDOT establishes Technical Advisory Groups (TAGs), one for each research focus area. Each TAG is comprised of representatives from IDOT, academia, industry, and government agencies with expertise in that specific research area. TAGs identify specific transportation needs as priorities for new research. ICT then posts these research needs on the ICT website, ict.illinois.edu, and invites interested parties to submit their research ideas for consideration by downloading the Proposed Research Idea Form. Submission deadlines are generally January 31 and June 30.

2. Evaluation of Proposals
After each Call for Research Ideas deadline, TAGs will review the research ideas in their focus area, prioritize them, and recommend projects to the ICT Executive Committee for funding consideration.

3. Selection of Funded Research Projects
The ICT Executive Committee makes the final decision on which Proposed Research Ideas are funded as research projects administered by ICT. The ICT Executive Committee is chaired by the IDOT Director of Highways (or designee) and is comprised of the ICT Director, Directors of the Offices and Divisions of IDOT, and an FHWA representative.

4. Selection of the Project Technical Review Panel
For each ICT research project, IDOT appoints a Technical Review Panel (TRP), chaired by an IDOT staff member, to oversee and guide the research. TRP members are selected based upon their expertise to ensure subject proficiency and diversity on each panel. Each TRP is responsible for reviewing and approving the research work plan, budget, project deliverables and final report, as well as providing regular feedback to the researchers. The TRP also prepares and administers a research implementation plan.

5. Selection of the Principal Investigator
The Principal Investigator (PI) can be a researcher from the University of Illinois, another university, another agency, or a consultant. ICT, with input from IDOT, determines if there are known researchers from the University of Illinois who can serve as the PI for each research project. In cases where selection of a suitable researcher is not clear, the ICT issues a formal request for research proposal (RFP) open to any researcher to respond. These RFPs are widely advertised and posted on the ICT website semi-annually. The project’s TRP then reviews all proposals and recommends a proposal to the ICT Director for development of a contract. In case of equivalent proposals, preference will be given to in-state educational institutions.

6. Work Plan Preparation
Once a PI is selected for a research project, the PI works with the TRP to develop a detailed work plan, which includes budget, implementation strategy, and deliverables.

7. Project Research
It is recommended that the PI meet quarterly with the TRP to provide updates on the project status and discuss project issues. The PIs are required to keep accurate records of their data analysis and work performed, and submit brief quarterly reports on their research progress. Project status and quarterly reports are available on the ICT website.

8. Completed Projects
After the researcher completes his/her project and is ready to disseminate the findings and conclusions, the PI works with his/her TRP and an ICT technical editor to finalize the project report so that the research findings are presented clearly and the report’s formatting is consistent with the ICT’s requirements. ICT posts the final report on the ICT website and national databases.

9. Implementation
IDOT executes the research implementation plan, with assistance from ICT as necessary.

Quality Control and Performance Evaluation
Throughout the entire process, IDOT and ICT have developed a quality control process to ensure a successful research program. Quality control procedures include monthly administrative meetings and semi-annual performance evaluations of the TRPs, PIs, and ICT administration.
ICT Adds 14 New IDOT Research Projects in FY12

ICT’s Executive Committee meets twice a year to prioritize submitted ideas for new research and determine which projects to fund. In fiscal year 2012, the committee funded 14 new projects and adjusted funds to expand the scope of two existing projects.

At its fall meeting on October 5, 2011, the Executive Committee approved the following new projects:

R27-44-T1: IDOT Pavement Design Course (Pavement Design/Materials TAG; PI Hasan Ozer, University of Illinois at Urbana-Champaign; TRP Chair Chuck Weinrank, IDOT)

R27-122: Improvement of Driven Pile Installation and Design in Illinois—Phase II (Structures, Hydraulics and Geotechnical TAG; PI James Long, University of Illinois at Urbana-Champaign; TRP Chair William Kramer, IDOT)

R27-123: Street Lighting Technologies—LED Street Lighting Evaluation—Phase II (Traffic Operations and Roadside Maintenance TAG; PI Rahim Benekohal, University of Illinois at Urbana-Champaign; TRP Chair Mark Seppelt, IDOT)

R27-124: Evaluation of Porous Granular Embankment Materials Used as Pavement Subgrade/Granular Subbase (Pavement Design/Materials TAG; PI Erol Tutumluer, University of Illinois at Urbana-Champaign; TRP Chair Sheila Beshears, IDOT)

R27-125: Sustainable Aggregates Production—Green Applications for Aggregate By-Products (Pavement Design/Materials TAG; PI to be determined; TRP Chair David Lippert, IDOT)

R27-126: Temporary Stabilization Specification Improvements (Environment TAG; PI Mark Grinter, Southern Illinois University, Edwardsville; TRP Chair, Matt Sunderland, IDOT)

At its spring meeting on April 27, 2012, the Executive Committee approved the following new projects:

R27-127: Safety and Efficiency Benefits of Implementing Adaptive Signal Control Technology in Illinois (Traffic Operations TAG; PI to be determined; TRP Chair Kyle Armstrong, IDOT)

R27-128: Testing Protocols to Insure Performance of High Asphalt Binder Replacement Mixes Using RAP and RAS (Pavement Design/Materials TAG; PI Imad Al-Qadi, University of Illinois at Urbana-Champaign; TRP Chair David Lippert, IDOT)

R27-129: Implementing of AIMS in Measuring Aggregate Resistance to Polishing, Abrasion, and Breakage (Pavement Design/Materials TAG; PI to be determined; TRP Chair Sheila Beshears, IDOT)

R27-130: Development of Improved Overlay Thickness Design Alternative for Local Roads (Pavement Design/Materials TAG; PI Erol Tutumluer, University of Illinois at Urbana-Champaign; TRP Chair Kevin Burke, IDOT)

R27-131: Leveraging Traffic and Surveillance Video Cameras for Urban Traffic (Planning TAG; PI Jakob Eriksson, University of Illinois at Chicago; TRP Chair Rob Robinson, IDOT)

R27-132: Incorporating NEPA Into the IDOT and MPO Planning Process (Planning TAG; PI Nora El-Gohary, University of Illinois at Urbana-Champaign; TRP Chairs Susan Stitt & Charles Perino, IDOT)

R27-133: Calibration and Refinement of Illinois Earthquake Resisting System Bridge Design Methodology—Phase II (Structures, Hydraulics & Geotechnical TAG; PI James LaFave, University of Illinois at Urbana-Champaign; TRP Chairs Dan Tobias & Mark Shaffer, IDOT)

R27-134: Strengthening of Bridge Wood Piling Retrofits for Moment Resistance—Phase II (Structures, Hydraulics & Geotechnical TAG; PI Bassem Andrawes, University of Illinois at Urbana-Champaign; TRP Chair Jim Klein, IDOT)

In addition, the Executive Committee approved four short-term special projects in FY2012:

R27-SP18: Developing Best Practices for Bicycle Trail Construction & Maintenance in Illinois (Environment TAG; PI Barry Dempsey, University of Illinois at Urbana-Champaign; TRP Chair Todd Hill, IDOT)

R27-SP19: Evaluation of the Effect of RAS on IDOT Asphalt Mixtures (Pavement Design/Materials TAG; PI Hasan Ozer, University of Illinois at Urbana-Champaign; TRP Chair David Lippert, IDOT)

R27-SP20: Safety Benefits of Implementing Adaptive Signal Control Technologies (Safety TAG; PI Rahim Benekohal, University of Illinois at Urbana-Champaign; TRP Chair Kyle Armstrong, IDOT)

R27-SP21: Illinois Carbon Monoxide Screen for Intersection Modeling 2012 Update (Environment TAG; PI Scott Peters, University of Illinois at Urbana-Champaign; TRP Chair Walt Zyznieuski, IDOT)
A unique feature of ICT is that even though it is within the Civil and Environmental Engineering Department at the University of Illinois at Urbana-Champaign, ICT proactively collaborates with other institutions. These cooperative relationships with other research partners expose more students to transportation research. Each year, ICT has significantly exceeded its target goals, as outlined in ICT’s intergovernmental agreement with IDOT, for collaboration with other universities and institutes, organizations, and agencies.

**Other Participating Universities and Institutes**

![BRADLEY UNIVERSITY](image1)

![ILLINOIS INSTITUTE OF TECHNOLOGY](image2)

![IOWA STATE UNIVERSITY](image3)

![MISSOURI STATE UNIVERSITY](image4)

![NORTHWESTERN UNIVERSITY](image5)

![ROOSEVELT UNIVERSITY](image6)

![SOUTHERN ILLINOIS UNIVERSITY EDWARDSVILLE](image7)

![TENNESSEE TRANSPORTATION INSTITUTE](image8)

![UNIVERSITY OF ILLINOIS AT CHICAGO](image9)

![UNIVERSITY OF ILLINOIS SPRINGFIELD](image10)

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**Fiscal Year Targets vs. Actual Collaboration**

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**ICT Continues Steady Growth**

In fiscal year 2012, ICT had over 70 principal investigators with active projects. ICT is proud of the diversity of our researchers, comprising investigators from many different academic disciplines, industry, and government agencies.

Since ICT’s inception in 2005, there has been a steady increase in the number of affiliated researchers and supported students.
ICT Celebrates IDOT Research Contributions

2012 ICT/IDOT High Impact Project

At the 94th Annual Transportation and Highway Engineering Conference (THE), ICT presented awards to recognize the outstanding efforts of its researchers and TRP chairs. The 2012 ICT High Impact Project was “Development of a Highway Incident Management Operational and Training Guide for Incident Responders in Illinois.” The TRP chair for this project was Geno Koehler, Policy and Safety Manager for IDOT Transportation Infrastructure Security. Principal investigators were Huaguo Zhou and Ryan Fries, both assistant professors in the Civil Engineering department at Southern Illinois University at Edwardsville. Students assisting on this project included Jing Huang, Tengfei Li, Zhaofeng Tian, Michael Williamson, and Xie Zheng. The judging criteria for the award included:

• Successful outcomes envisioned at the start of the project
• Demonstrated commitment, teamwork, and technical expertise
• Meaningful impact on IDOT policies and practices

2012 TRP MVP

ICT also presented the 2012 TRP MVP award at the conference. To be considered for this award, TRP chairs who had active projects during the past year must have exhibited exemplary service. This year’s award recipient was Daniel Tobias, Concrete Products Engineer for the IDOT Bureau of Materials and Physical Research. Tobias chaired three ICT projects in FY 2012:

• R27-070: Calibration and Refinement of Illinois’ Earthquake Resisting System Bridge Design Methodology
• R27-082: Strengthening of Bridge Wood Pilings—Retrofits for Moment Resistance
• R27-088: Bridge Decks: Mitigation of Cracking and Increased Durability

Tobias has served as a TRP chair for three years and has received praise for working to ensure findings affect IDOT policy, offering thoughtful and constructive comments during the research process and possessing strong leadership abilities.
The ICT/IDOT 3-D Laser Scanning project was selected as one of the nation’s 16 high value research projects for 2011 by the American Association of State Highway and Transportation Officials (AASHTO) Research Advisory Committee. The study found that a 3-D laser scanning realized “significant man-hour savings over traditional surveying.” Scanning took 18 man-hours/mile, while the conventional method took 28 man-hours/mile.

The research team, led by investigators Dianne Slattery and Kerry Slattery of Missouri State University, coordinated with several construction projects to obtain laser scans of initial and final conditions at the same time that the traditional surveys were being conducted. Working closely with an IDOT Technical Review Panel led by Ted Nemsky, they compared laser scan information with the traditional surveys taken independently by resident engineers. The team also developed software to calculate earthwork quantities from information gathered by the laser scanner. Additional software was developed to optimize setup locations for laser scanner surveys.

AASHTO has four regions, and each region selected its top four projects. As one of the selected projects, the ICT/IDOT 3-D Laser Scanning project was featured during the 2011 AASHTO Research Advisory Committee Meeting. This project was also featured at the 2012 annual meeting of the Transportation Research Board (TRB) poster session entitled, “State Departments of Transportation High Value Research Projects;” which is sponsored by the TRB Standing Committee on Design and Construction.
Fiscal Year 2012 Active Principal Investigators

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Suleiman Ashur
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Imad Al-Qadi, ICT director, was named Member Emeritus of the Transportation Research Board (TRB) Committee on Sealants and Fillers for Joints and Cracks. TRB established the emeritus membership category to recognize significant and long-term contributions to the committee.

Additionally this year, Al-Qadi was elected to the Board of Governors for the Transportation and Development Institute (T & DI) of the American Society of Civil Engineers (ASCE). He was also elevated to Honorary Member of Chi Epsilon, the honor society for civil engineering. Professor Al-Qadi gave the Sneed Distinguished Lecture at Texas A&M University and was keynote speaker at the GeoAmerican Conference in Peru. He was also named Honorary Guest Professor at Southeast University in Nanjing, China.

Bill Buttlar, ICT investigator, was appointed as an associate dean in the Graduate College at the University of Illinois at Urbana Champaign. In this role, Buttlar works to enhance online graduate education at the university and enhance professional and interdisciplinary graduate programs around campus.

Marcelo Garcia, ICT investigator, was selected by the Environmental Water Resources Institute to receive the 2012 Hunter Rouse Hydraulic Engineering Award for outstanding contributions to the field of hydraulic engineering for over 25 years, including research, teaching, and service.

James Hall, ICT investigator, was named Hanson Professional Services Faculty Scholar for 2012 at the University of Illinois at Springfield. Hall is an associate professor in the Department of Management Information Systems.

David King, ICT senior fiscal operations manager, was awarded the 2011 University of Illinois at Urbana-Champaign Department of Civil and Environmental Engineering Award for Excellence.

Andrea Ruedi, ICT deputy director, was awarded the Provost's Scholarship for the Executive Master of Business Administration program at the University of Illinois at Urbana-Champaign. The scholarship is competitively awarded to up to two Urbana campus faculty or staff members who qualify for admission to the program.

Jeffrey Roesler, ICT investigator, received the American Concrete Pavement Association's (ACPA) 2011 Marlin J. Knutson Award for Technical Achievement. This award is presented annually to an individual or group who has made significant contributions to advance the development and implementation of innovative technical and best practice approaches in the design and construction of concrete pavements.

Timothy Stark, ICT investigator, received the 2011 Journal of Legal Affairs and Dispute Resolution in Engineering and Construction's Best Scholarly Feature, Case Study, or Paper Award. The award, presented by the American Society of Civil Engineers, honors Stark’s paper, “Is Construction Blasting Still Abnormally Dangerous?” that appeared in the November 2010 issue of the journal.

Additionally, Stark received the Associate Editor Award for the Journal of Geotechnical and Geoenvironmental Engineering for 2012.
Marshall Thompson, ICT investigator, received the Leadership in Bituminous Engineering Award at the 52nd Annual Illinois Bituminous Paving Conference, held in December 2011.

Huaguo Zhou, ICT investigator, received an Excellent Paper Award at the International Chinese Transportation Professional Association’s 24th Annual Conference & NACGEA International Symposium on Geo-Trans. The paper, co-authored with Enrique Gonzalez-Velez, was titled “Development of an Integrated MOT Training Program for Incident Responders to Improve Traffic Safety and Mobility” and was one of only five papers designated with this honor.

Excellence in Teaching Awards

Several ICT researchers have been named to the University of Illinois at Urbana-Champaign 2011 List of Teachers Ranked as Excellent by their students. This list is compiled after each semester and is based on evaluation forms completed by students. Faculty members receiving this honor include Bassem Andrawes, Larry Fahnestock, Marcelo Garcia, Youssef Hashash, James LaFave, Liang Liu, James Long, John Popovics, and Scott Olson.
Behzad Behnia, ICT student researcher, won the 2011 Association of Asphalt Paving Technologists Scholarship.

Amanda Bordelon, former ICT student researcher, successfully defended her thesis, "Flowable Fibrous Concrete Inlay Pavements." She accepted an assistant professor position at the University of Utah at Salt Lake City. Bordelon was advised by Professor Jeff Roesler.

Francisco Evangelista, Jr., former ICT student researcher, successfully defended his thesis, "Three-Dimensional Modeling of Failure in Quasi-Brittle Materials and Structures." He accepted an assistant professor position at California State University, Los Angeles in January 2012. Evangelista was advised by Professor Jeff Roesler.

Angeli Gamez, ICT student researcher, was awarded the Federal Highway Administration’s Dwight David Eisenhower Graduate Fellowship. Gamez is currently working with Professor Imad Al-Qadi studying the impact of wide-based tires on pavement damage.

Zhen Leng, ICT post-doctoral researcher, passed his final Ph.D. exam in 2011. His thesis was entitled “Prediction of the In-Situ Asphalt Mixture Density Using Ground Penetrating Radar: Theoretical Development and Field Verification.” Leng was advised by Professor Imad Al-Qadi and has accepted an assistant professor position at Hong Kong Polytechnic University.

Additionally, Leng was presented with the Annual Innovative Research Award at the 52nd Illinois Bituminous Paving Conference.

Pengcheng Shangguan, ICT student researcher, was presented with the Annual Innovative Research Award at the 52nd Illinois Bituminous Pavement Conference.

Deb Mishra, ICT post-doctoral researcher, successfully defended his thesis, "Aggregate Characteristics Affecting Response and Performance of Unsurfaced Pavements on Weak Subgrades." Mishra was advised by Professor Erol Tutumluer and has accepted a post-doctoral position with the Illinois Center for Transportation.

Songsu Son, ICT student researcher, was presented with the Student Research Award at the 52nd Illinois Bituminous Paving Conference.

Hao Wang, former ICT student researcher, successfully defended his thesis, “Analysis of Tire Pavement Interaction and Pavement Responses Using a Decoupled Modeling Approach.” He accepted a position at Rutgers University. He was advised by Professor Imad Al-Qadi.
ICT students work closely with professors to learn cutting-edge research methods and go on to have impressive academic and professional careers.

**Clockwise from top:**

ICT student researchers, along with Professor Imad Al-Qadi, attend the 2012 Transportation Research Board Annual Meeting.

ICT student researcher Angeli Gamez collects pavement data using the Hamberg Wheel Tracker.

ICT student researchers Hermant Chavan, Nathan Kebede, Catalina Gonzalez, and Jaime Hernandez take a break to meet new students and faculty at the 2011 Back-to-School Cook-Out, which was held at ATREL.

ICT student researcher Saleh Yousefi tests the rheology of crack sealant in the ATREL binding lab.
ICT maximizes the impact of its research through technology transfer. This includes conferences, training classes, workshops, and peer exchanges. Additionally, ICT publishes its research on its website, in a wide variety of publications, and through national databases. This section details our efforts and gives more information about how to connect with ICT through different mediums.

ict.illinois.edu

With visitors from 198 countries and over 2.5 million page views, the ICT website is the most far-reaching tool ICT has for publicizing its research. From the website, interested parties can:

- Download ICT's published final reports.
- Track the progress of ongoing research projects.
- View videos on ATREL and ICT, as well as past Kent seminars and TRB presentations.
- Sign up for notification lists and the quarterly newsletter.
- View upcoming training and educational schedules.
- Follow news from ICT, ATREL, and the University of Illinois transportation program.
- View IDOT Requests for Proposals and Calls For Research Ideas
- Search ICT’s database of over 75 archived IDOT research projects

Social Media

ICT has a facebook page and a LinkedIn discussion group. The facebook page offers updates on upcoming events, news about student and faculty achievements, and links to ICT research featured in media reports. ICTs LinkedIn group features information about open RFPs, and upcoming conferences and events. It also provides an opportunity to pose questions to and discuss ideas with over 700 transportation engineering professionals from around the world.

To "like" ICT on facebook or to join the Illinois Center for Transportation LinkedIn group, visit the ICT website home page and click on the facebook icon or LinkedIn icon.

ICT Publications

In addition to the ICT annual progress report to keep researchers and colleagues up to date on ICT happenings, ICT sends a quarterly electronic newsletter. To sign up for the e-newsletter or to request additional copies of the annual report, please email ICT-info@illinois.edu.

ATREL Engineering Open House

ATREL graduate students exhibited at the University of Illinois at Urbana-Champaign 2012 Engineering Open House in March. After demonstrating the actual asphalt pavement construction process—from aggregate sieving to batching to testing the performance of asphalt mixture (including a mini ATLAS demo)—the students had attendees create their own “asphalt” mixture. Using chocolate syrup as binder, attendees could choose from various candy “aggregates” of various sizes and textures, as well as coconut to represent fiber, to create their edible mixture. The fun and educational exhibit was very popular.

ICT Postdoctoral Research Associate Zhen Leng demonstrates the process of hot-mix asphalt with the help of candy “aggregates” and chocolate syrup “binder.”
ICT Adds Distance Learning Capabilities

With IDOT support, ICT added distance learning capabilities to its classroom at ATREL. Currently, the new equipment is being used to record the weekly Kent Seminar series and major conference presentations so they can later be viewed on the ICT website. ICT also offers live workshops and training seminars at which engineers can earn professional development hours (PDHs). Prior to the 2012 TRB Annual Meeting, ICT hosted live webinars for IDOT engineers to view TRB presentations by ICT researchers and earn PDHs.

Field Training/Certification Workshops

ICT also offers several courses to train practitioners on various aspects of the research conducted. In 2012, ICT offered courses on Documentation of Contract Quantities and on Erosion and Sediment Control.

The Documentation of Contract Quantities course is required for all consultants who perform construction inspection for IDOT. This three-day course ensures there are well-educated, prequalified consultants to perform construction inspection in Illinois. The course is also offered to full-time IDOT and local agency personnel, which helps ensure that quality construction and documentation practices are followed throughout the state. In 2011–2012, 525 people attended the 15 sessions.

New for 2012, ICT began to offer an Erosion and Sediment Control course. This course is designed for IDOT contractors, inspectors, designers, and others interested in erosion and sediment control and stormwater management best practices for a sustainable environment. The course is offered several times throughout the spring and summer.

More information on both workshops can be found on the ICT website under the “Training” tab on the left side of the home page.

2012 Kent Lecture Features Charles Potts, CEO, Heritage Construction and Materials

ICT was proud to welcome Charles Potts, CEO of Heritage Construction and Materials, based in Indianapolis, as its Paul Fraser Kent Distinguished Lecture speaker for 2012. Potts’ presentation, titled, “America’s Transportation Network: Building for the Future,” addressed the current state of the U.S. transportation network and focused on solutions for addressing overcrowding and underfunding.

The Paul Fraser Kent Distinguished Lecture, which began in 2007, honors outstanding leadership in the field of transportation engineering. Paul Kent was a 1920 graduate of the University of Illinois in civil engineering. Throughout his career, he expressed the highest regard for the engineering education he received at the University of Illinois.

The Kent lecture fund also supports a weekly transportation seminar series for transportation students and interested parties. Some other Kent Lecture Series speakers include:

- Morris De Beer, CSIR Built Environment, South Africa
- Sandra Erkens, Rijkswaterstaat Centre of Transport and Navigation (DVS), Netherlands
- Jiankun Liu, Beijing Jiaotong University
- André Molenaar, Delft University, Netherlands
Visitors to ATREL

The transportation community and friends of ICT are always welcome at ATREL. Below are some of the visitors to ATREL this past year.

- Beijing Jiatong University
- Dalian University of Technology, China
- Harbin Institute of Technology, China
- The Council for Scientific and Industrial Research, South Africa
- IDOT Hazardous Materials Training Class
- IDOT Fall Planning Conference
- International Concrete Crosstie & Fastening Symposium
- Military Engineering Institute, Rio de Janeiro, Brazil
- Southwest Jiaotong University, China
- Zheijiang University, China

ICT Has Strong Showing at the 2012 TRB Annual Meeting

Over 50 presentations were made by ICT researchers at the 2012 Transportation Research Board (TRB) annual meeting, which convened in Washington D.C. on January 22–26. ICT researchers presented cutting-edge research on diverse topics across the spectrum of transportation research and participated on various committees.

Approximately 10,000 transportation officials from around the world attended the conference, which covers all transportation modes. More than 3,000 presentations were made in over 600 sessions. Attendees included policy makers, administrators, practitioners, researchers, and government, industry, and academic institutions.

Sponsored Conferences

Each year, ICT sponsors various conferences that allow transportation engineers and researchers to share their latest research and discuss best practices. During FY 2012, ICT sponsored several conferences, including the following:

- 52nd Annual Illinois Bituminous Conference—Speakers from across the nation and around the world presented at this year’s conference in Champaign, Illinois, on topics including high-recycled asphalt pavement, current research on durable thin overlays and warm mixes, paving on the Indianapolis Motor Speedway, and pavement engineering in the Netherlands. Over 300 participants attended this event, which was also sponsored by IDOT. The next Illinois Bituminous Conference is December 12, 2012. Please check the ICT website for program and registration details.

- 98th Annual Transportation Highway Engineering (THE) Conference—This year over 1,100 transportation engineers, officials, technicians, faculty, and students gathered to discuss issues critical to the safe and economical movement of people and goods across Illinois. IDOT also sponsored this conference, held at the Illini Union of the University of Illinois at Urbana-Champaign campus. The next THE Conference will be in February–March 2013. Details will be available on the ICT website as they are available.

- 7th Annual RILEM International Conference on Cracking in Pavements—Held June 20–22, 2012 at the TU Delft Campus in the Netherlands, this conference featured over 130 papers from researchers, engineers, and government officials. Future RILEM Conference details will be available on the ICT website as they become available.

University of Illinois at Urbana-Champaign Civil and Environmental Engineering Professor Yanfeng Ouyang presents at the 2012 Transportation and Highway Engineering Conference (THE).
Research Published
ICT ensures its research is disseminated to the transportation engineering community through a variety of publications. Completed ICT research is available in the Transportation Research Board’s (TRB) Transportation Research Information Database (TRID). ICT also provides regular project updates for ongoing projects to TRB’s Research in Progress (RIP) database. Additionally, below is a partial list of magazines and journals that have featured ICT research:

Accident Analysis & Prevention
Advances in Structural Engineering
Asphalt Contractor
Better Roads
Earthquake Spectra
Engineering Structures
Engineering, Construction and Architectural Management
European Journal of Environmental and Civil Engineering
FHWA Transportation and Climate Change Newsletter
Ingeneria Dictuc
International Journal of Pavement Engineering
International Journal of Road Materials and Pavement Design
International Journal of Transportation Research
International Journal of Transportation Systems Engineering and Information Technology
Journal of Civil Engineering Materials
Journal of Construction Engineering and Management
Journal of Engineering Mechanics
Journal of Nondestructive Testing and Evaluation
Journal of Public Transportation
Journal of Solids and Structures
Journal of Testing and Evaluation
Journal of the Association of Asphalt Paving Technologists
Journal of the Chinese Ceramic Society
Journal of the Mechanics and Physics of Solids
Journal of Transportation Engineering
The Journal of the Acoustical Society of America
Traffic Technology International
Transportation Research Record: Journal of the Transportation Research Board

Research Presented
ICT affiliates were invited to present their research at numerous events throughout the year, including the following:

1st Conference of the Transportation Research Group of India, Bangalore, India
2nd PanAmerican Congress on Geosynthetics, Lima, Peru
6th International Conference on Bridge Maintenance, Safety, and Management, Lake Como, Italy
7th Conference on Behavior of Steel Structures in Seismic Areas, Santiago, Chile
7th International RILEM Conference on Cracking in Pavements, Delft, the Netherlands
10th International Congress on Advances in Civil Engineering, Ankara, Turkey
19th International Symposium on Traffic and Transportation Theory
91st Annual Meeting of the Transportation Research Board
98th Annual Transportation and Highway Engineering Conference
2012 ASCE Structures Congress
2012 ASCE T & DI Congress
2012 Transport Chicago
AASHTO Research Advisory Committee Annual Meeting
Annual Meeting of the American Association of Asphalt Paving Technologists
College of Engineering Industry Advisory Board
Falling Weight Deflectometer Users Group Annual Meeting
Illinois Bituminous Paving Conference
Illinois Tollway Authority Board of Directors Meeting
Illinois Traffic Engineering and Safety Conference
International Heavy Haul Association Conference, Railroading in Extreme Conditions, Calgary, Canada
International Symposium on Environmental Ecology and Technology of Concrete, Beijing, China
Southeast University, Nanjing, China
Structural Stability Research Council Annual Meeting
Texas A&M University, E.B. Snead Distinguished Lecture
ICT works with numerous local, state, national, and international government agencies and professional organizations to conduct cutting-edge transportation research. Below, a few of ICT’s latest projects are highlighted.

Ground Penetrating Radar Used to Predict In-Situ Asphalt Mixture Density
(Sponsored by the Federal Aviation Administration)

In-situ asphalt mixture density is a critical quality control/assurance property for flexible pavements. Traditional methods to measure this property, such as field core extraction using a nuclear gauge, have major limitations. To overcome limitations, a new method based on electromagnetic waves using ground penetrating radar (GPR) was developed. This method provides non-destructive, continuous, and rapid asphalt mixture density prediction. Density prediction models were derived using an asphalt mixture’s volumetrics and its components’ dielectric constant based on electromagnetic mixing theory. The models and associated computer program will assist engineers in using GPR as a non-destructive tool for in-situ asphalt mixture density measurement.

Predicting Stop-and-Go Driving Patterns
(Sponsored by NSF)

Drivers in congested traffic often find themselves engaged in frequent stop-and-go driving oscillations, which create extra fuel consumption, air pollution, driving discomfort, and safety hazards. Traffic oscillation remains a puzzling phenomenon as no analytical method has accurately explained the macroscopic oscillation phenomenon based on individual drivers’ nonlinear car-following behavior. This project develops a new analytical approach to accurately quantify and reproduce observed oscillation propagation under a general class of nonlinear car-following laws. Validation with real-world field data showed great success.

Sensor Network Planning for More Reliable Transportation Network Surveillance
(Sponsored by CSX, NEXTRANS, & NSF)

Many transportation engineering challenges stem from lack of accurate observation of network traffic states at fine and temporal spatial scales. While various sensor technologies have been used to sample traffic data, deploying sensors to intercept and synthesize the most useful information remains a problem because surveillance effectiveness depends on information extraction mechanisms as well as sensor integrity. The surveillance benefit is difficult to evaluate for a given design when there is the possibility of random sensor malfunctions. This project analyzes the optimal design of traffic sensor locations under complex situations. Using advanced mathematical formulations and customized-solution algorithms, this modeling framework unifies several types of commonly seen traffic surveillance benefits into a general form and maximizes the expected value of this generalized benefit under site-dependent sensor disruption risks.

Amplitude Growth from Field Measurement and Analytical Prediction Helps Determine Stop-and-Go Patterns

Warm-Mix Asphalt Technology: Research to Determine When to Open Road to Traffic; Offer General Usage Guidelines
(Sponsored by the Illinois State Toll Highway Authority)

Since warm-mix asphalt (WMA) doesn’t need to be heated to the high temperatures hot-mix asphalt requires, it has energy-saving and safety benefits. However, it is necessary to investigate the short- and long-term performance of WMA. Also, research needs to determine when it can be safely driven on after installation. ICT research investigated the short-term performance of stone matrix asphalt (SMA) prepared with various warm-mix techniques. Through extensive laboratory and on-site investigation, the study determined desired performance can be achieved when using SMA containing...
various WMA additives. As a result of the findings, an approach to determine the appropriate time for opening pavement to traffic was developed to maximize the economic and environmental advantages.

Testing and Development of Hot-Poured Crack Sealant Performance Guidelines  
(Sponsored by Transportation Pooled Fund Program supported by nine state DOTs and the Ontario MOT.)

Sealing cracks in asphalt concrete pavements is a very commonly used preventive maintenance treatment that has been proven to reduce the rate of pavement deterioration. Recently, performance guidelines were developed at the University of Illinois as a systematic procedure to select hot-poured bituminous crack sealants as treatments. Earlier work proposed a “sealant grade” (SG) system to select a hot-poured crack sealant based on environmental conditions. Seven performance-related laboratory tests and procedures were developed to allow for sealant selection based on performance. An extensive field study is underway to determine the performance-related threshold values using an array of field performance data. These site installations in various climate zones in North America have been completed, and performance monitoring of sealant treatments will continue for three years. The study will validate and/or modify laboratory tests to determine SG and will develop crack-sealing guidelines for field applications.

Ternary Concrete with Fractionated Reclaimed Asphalt Pavement (FRAP)  
(Sponsored by the Illinois State Toll Highway Authority.)

Fractionated reclaimed asphalt pavement (FRAP) is being investigated as a partial replacement of coarse aggregate in ternary concrete, which consists of cement, slag, and fly ash, for rigid pavement applications. Current studies include testing two-left and full depth slabs (six feet by six feet) and will result in methods to facilitate FRAP-paste bond improvement.

Lake County, Illinois Snow Plow Routing Analysis and Design Optimization  
(Sponsored by the Lake County Division of Transportation.)

Snow control is a key component of winter maintenance for urban and regional public works agencies in climates with frequent snowfall and ice. The goal of this ongoing project is to develop a GIS-based visualization software tool that optimizes a set of snow plow routes based on a combination of user-set input parameters. This state-of-the-art software will maximize efficiency of routes in both long- and short-term storm situations and will allow engineers to evaluate snow plow options such as salt usage, vehicle capacity, fleet size, and plow time. It will also provide turn-by-turn truck route recommendations.

Field Imaging of Large Aggregate Shape, Texture, and Angularity  
(Sponsored by BNSF Railroad, Association of American Railroads, & Tensar International, Inc.)

The size of certain aggregate materials, such as railroad ballast and aggregate subgrade, cannot always be established through regular laboratory tests. Research is being conducted to determine a methodology for characterizing the size and shape properties of aggregates. The University of Illinois Aggregate Image Analyzer has been redesigned with new progressive scan cameras to capture high resolution color images of aggregate particles from three orthogonal views. Images are then analyzed through customized vision-based algorithms to establish particle size distribution and shape properties to aid in preparing improved material specifications.
ICT’s IDOT Research Areas

ICT administers, manages, and conducts research that leads to safer, more cost-effective, and sustainable roads for the taxpayers of Illinois. This year, ICT researchers have investigated questions such as how Illinois can prevent wrong way driving fatalities, better plan construction projects, and implement a more effective system of pavement marking.

This section details ICT’s projects for each Technical Advisory Group (TAG). One active project from each TAG is highlighted to represent the research contributions each TAG makes. The eight TAGs that comprise ICT’s scope of research are as follows.

- Construction
- Environment
- Pavement Design and Management/Materials
- Planning
- Public and Intermodal Transportation
- Safety Engineering
- Structures/Hydraulics/Geotechnical
- Traffic Operations and Roadside Maintenance

Each TAG section in this report lists the IDOT projects that were active in fiscal year 2012, as well as the projects that were completed in 2012 and previous years. Final reports for completed projects and progress reports for projects still in progress can be found in the ICT website’s searchable database.
**Construction Spotlight**

The Construction Technical Advisory Group (TAG) focuses on innovative construction techniques, project management, inspection of work, and compliance with specifications.

**Construction TAG Members**
- Tim Kell, TAG Chair—IDOT, Bureau of Construction
- Rick Borus—IDOT, Bureau of Airport Engineering
- Tara Elston—IDOT, Bureau of Design and Environment
- Chris Fraley/Scott McGuire—Federal Highway Administration, Illinois Division
- Herb Jung—IDOT, District 3
- Ted Nemsky—IDOT, District 8
- John Peisker—O’Neal Brothers, Illinois Asphalt Pavement Association
- Randell Riley—Illinois Chapter of the American Concrete Pavement Association
- Art Snyder—Civil Constructors, Inc.
- Mike Wiater—IDOT, District 1
- Nora El-Gohary—University of Illinois at Urbana-Champaign, ICT representative
- Charles Wienrank, TAG Secretary—IDOT, Bureau of Materials and Physical Research

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**An Expert Systems Approach to Highway Construction Scheduling (R27-86)**

**Completed:** 9/2011  
**Investigators:** Dianne Slattery, Kerry Slattery, and Richard Bruce, Missouri State University  
**TRP Chair:** Mike Ripka, IDOT, Bureau of Construction Compliance

**Project Summary**

When design engineers create construction schedules for various IDOT projects, a variety of mitigating factors can lead to the projects getting off-schedule. There is a need for a more scientific method of construction scheduling that prevents loss of time and money.

**Research Objectives**

To develop more realistic construction schedules by creating a software tool, the Illinois Construction Scheduling Expert System (ICSES).

**Methodology**

- Develop a database on expert systems in highway construction scheduling.
- Analyze historical weather records from the Illinois State Water Survey and National Oceanographic and Atmospheric Administration to determine the probable number of rain days per month and probable periods during which temperature-sensitive construction operations could be conducted.
- Develop a software tool, utilizing synthesized data, to assist designers in creating schedules for a variety of typical highway construction activities.

**Technology Transfer and Research Impact**

The developed ICSES tool is customized to Illinois. The tool allows users to select the project location and link to temperature records for their location and identify weather-dependent tasks for their specific construction projects. It also allows the addition of new schedule templates among users, and additional production-rate information can be made available to all users. The impact of this tool will continue to increase as users add their accumulated knowledge and create new project templates.

“**The ICSES software is the first of its kind to combine unique weather data and updated equipment productivity rates with various other situational factors that can affect how long a construction project will take. Ultimately, the tool will lead to a more realistic contract time limit, which will save Illinois taxpayers money.**”

— Mike Ripka, IDOT, Bureau of Construction Compliance
Environment Spotlight

The Environment Technical Advisory Group (TAG) focuses on developing methodologies to improve noise impact, air quality, natural resources, and water quality.

Environment TAG Members
Barb Stevens, TAG Chair—IDOT, Bureau of Design and Environment
Scott Marlow—IDOT, Bureau of Design and Environment
Craig Mitckes—IDOT, Bureau of Operations
Jan Piland—Federal Highway Administration, Illinois Division
Tom Ripka—IDOT, Bureau of Construction
Matt Sunderland—IDOT, Bureau of Design and Environment
Walt Zyznieuski—IDOT, Bureau of Design and Environment
Jane Lin—University of Illinois at Chicago, ICT representative
Joe Vespa, TAG Secretary—IDOT, Bureau of Materials and Physical Research

Restoration Progress and Flood Disturbance at IDOT Wetland Mitigation Sites (R27-114)

TRP Chair: Thomas Brooks, IDOT, Bureau of Design and Environment

Project Summary
Wetlands are low, poorly drained areas in the landscape that serve many purposes—such as water purification and flood prevention. They are protected under the Federal Clean Water Act and the Illinois Interagency Wetland Policy Act of 1989. To meet the goal of no net loss of wetlands, guidelines require 1.5 acres of wetland must be created for each acre lost. While environmental considerations play an important role in IDOT’s decisions, occasionally it is necessary to impact wetlands in the development of new highways or the improvement of existing ones.

Research Objectives
Most IDOT wetland mitigation sites are located within floodplains. While floodplain wetlands are supported by regular flooding, extreme flooding can produce excessive sediment, create ice damage, and inundate and kill wetland plants. To ensure IDOT wetland mitigation sites are functioning similarly to naturally occurring wetlands, it is necessary to quantify flood characteristics, with particular focus on the achievement of vegetation-based performance standards.

Methodology
• Synthesize existing data housed at the Illinois Natural History Survey and the Illinois State Geological Survey for statistical analysis.
• Conduct field study to determine the effect of flooding on planted tree survival at newly constructed wetlands.
• Quantify flood characteristics at several IDOT wetland mitigation sites and analyze the relationship between flooding and plant community development.
• Develop best management practices for wetland mitigation in Illinois.

Technology Transfer and Research Impact
This project will allow IDOT to understand the ecosystems present in wetland mitigation sites and institute best practices in wetlands development. The resulting project guidelines address regional and climactic differences throughout the State of Illinois, making the guidelines transferrable to other states.

“Results of this research will be used to propose a recalibration or regionalization of the one-size-fits-all performance standards commonly used today. Agencies such as the U.S. Army Corps of Engineers are actively engaged in this project and are eager to implement the outcomes.”

— Thomas Brooks, IDOT, Bureau of Design and Environment

Thin, Quiet, and Long-Lasting High Friction Surface Layer (R27-42)

**Investigators:** Imad Al-Qadi and Samuel Carpenter, University of Illinois at Urbana-Champaign

**TRP Chair:** Tom Zehr, IDOT, Bureau of Physical and Materials Research

**Project Summary**
There is a localized shortage of aggregates used in flexible (asphalt concrete) pavements that provide adequate friction. Friction is an important safety feature for pavements, and there is a need to develop an alternative pavement cross section, which will result in saving money and time, while improving driver safety.

**Research Objectives**
To develop a cost-effective mix for a new generation of thin-wearing surface/overlay. The newly developed thin surfaces will be designed for better performance and possess good durability, optimized friction, and low noise features.

**Methodology**
- Develop the next generation of new thin pavement layers—including composition layers. Then, determine engineering characteristics and cost effectiveness.
- Construct test sections of the developed mixes on Illinois Route 72 from Hoffman Estates to Barrington in the northwest Chicago suburbs.
- Conduct raveling, rutting, fracture, dynamic modulus, moisture susceptibility, and friction tests.
- Conduct lab tests of field samples.
- Develop life-cycle assessment (LCA) of new overlays

**Technology Transfer and Research Impact**
Using developed mixes’ data and field validation, investigators will perform an engineering benefit analysis and develop new mix designs that are durable, provide sufficient friction, and possibly lower noise. New mix designs will save money, increase pavement durability, and make roads safer.

Preliminary results of this research have been discussed at the 90th Annual Transportation Research Board Meeting in Washington D.C. Because this research seeks to combine better quality pavements at a more affordable cost, there has been a great deal of interest in the findings across the nation and internationally.

“With the development of next-generation hot-mix asphalt overlays that use more locally sourced aggregates, saving transportation cost while maintaining pavement friction, Professor Al-Qadi and his team are leading the charge to make Illinois roads safer and more cost effective.”

— Tom Zehr, IDOT, Bureau of Materials and Physical Research

(Top left) Vehicles equipped with ground-penetrating radar allow researchers to determine effectiveness of a pavement surface/overlay. (Above) A crew at ATREL constructs a test pavement.
**Implementing Pavement Management Systems for Local Agencies—State-of-the-Art/State-of-the-Practice (R27-87)**

**Completed:** 12/2011  
**Investigators:** Angela Wolters and Katie Zimmerman, Applied Pavement Technology, Inc.; Kerrie Schattler, Bradley University  
**TRP Chair:** Kevin Burke, IDOT, Bureau of Local Roads and Streets

**Project Summary**

Pavement management systems (PMS) are commonly used by large state and metropolitan entities to preserve pavement networks and determine the level of funding required to meet agency goals for desired levels of service. While many smaller agencies have similar operational and organizational needs as larger agencies, many county and municipal agencies in Illinois have not implemented PMS.

**Research Objectives**

To develop guidelines and recommendations for local agencies interested in implementing PMS customized to their specific needs.

**Methodology**

- Analyze data collection methodologies, pavement management software, and pavement management processes implemented by local agencies throughout the U.S.
- Determine the current PMS “state-of-the-practice”.
- Develop guidelines for implementing a new PMS at local agencies.

**Technology Transfer and Research Impact**

This research is synthesized in the *Implementation Guide for Pavement Management Systems* for local agencies’ use. The information will allow local agencies to identify the most effective PMS for their specific needs, which will in turn lead to cost savings, greater efficiency, and an objective, engineering-based approach to road maintenance. The guide is available on the IDOT website.

“This research project provided the Illinois Local Technical Assistance Program with resources to educate local agencies about the benefits and implementation of pavement management systems. Furthermore, the research project supports the Illinois Department of Transportation’s policy for local agencies to have a pavement management system in order to implement pavement preservation using federal, state, or motor fuel tax funds.”  
— Kevin Burke, P.E., Chief, Local Policy & Technology Unit, IDOT, Bureau of Local Roads and Streets
The quick and efficient movement of freight through Illinois is integral to the overall effectiveness of its transportation network.

— Chuck Abraham, IDOT, Program Support Section

The Public and Intermodal Transportation Technical Advisory Group (TAG) focuses on public transportation, freight traffic issues involving all transportation modes (i.e., rail, truck, port, and air freight traffic), and intermodal transportation.

Public and Intermodal Transportation TAG Members
Chuck Abraham, TAG Chair—IDOT, Program Support Section
Claire Bozic—Chicago Metropolitan Planning Agency
Norm Johnson—IDOT, Bureau of Urban Program Planning
David Tomzik—PACE Suburban Bus Service
Amy Welk—IDOT, Program Support Section
Kouros Mohammadian—University of Illinois at Chicago, ICT representative
Megan Swanson, TAG Secretary—IDOT, Bureau of Materials and Physical Research

“Freight movement is a major component of Illinois’ transportation needs, and it’s essential IDOT understands how goods are moving across the state to maintain efficiency. This study lays a solid foundation for understanding how and why goods are shipped and what IDOT can do to ensure effective operations and adapt for future trends.”

— Chuck Abraham, IDOT, Program Support Section

Goods Movement Study in Illinois: Application to Freight Transportation and Logistics (R27-83)

Investigator: Kouros Mohammadian, University of Illinois at Chicago
TRP Chair: Michael Garcia, IDOT, Bureau of High Speed and Passenger Rail

Project Summary
The volume of freight that flows within the United States continues to rapidly increase. According to the most recent U.S. Census Bureau’s Commodity Flow Survey, over 13 billion tons of goods, valued at nearly $12 trillion, are moved in the U.S. each year. Knowledge of current patterns of freight activities and decision-making processes is fundamental for developing a model to explain goods movement in Illinois and across the nation.

Research Objectives
This study focused on businesses that provide shipping services in Illinois to understand their underlying decision-making process so their freight movement and the distribution chain can be better replicated. The results can help IDOT and other agencies improve freight and passenger movement more efficiently and better maintain the state-owned transportation infrastructure.

Methodology
• Develop a feedback approach from experts in the field of freight transportation.
• Establish a method to characterize and analyze shipment information.
• Analyze data for relevant conclusions.

Technology Transfer and Research Impact
This study will allow IDOT to better understand how freight moves across Illinois and predict future trends as freight technology becomes more sophisticated and complex. As a result, IDOT will be able to better plan strategies for making goods movement more efficient and maintain and improve the state’s infrastructure accordingly.

The Public and Intermodal Transportation Technical Advisory Group (TAG) focuses on public transportation, freight traffic issues involving all transportation modes (i.e., rail, truck, port, and air freight traffic), and intermodal transportation.

The quick and efficient movement of freight through Illinois is integral to the overall effectiveness of its transportation network.
Investigation of Contributing Factors Regarding Wrong-Way Driving on Freeways (R27-90)

Investigators: Huaguo Zhou, Ryan Fries, Brent Vaughn, and Chiang Lin, Southern Illinois University at Edwardsville

TRP Chairs: Dave Piper and Priscilla Tobias, IDOT, Bureau of Safety Engineering

Project Summary
Wrong-way driving is a factor in 27% of fatal crashes in Illinois. By closely examining each of these, common contributing factors can be determined and countermeasures can be recommended.

Research Objectives
The purpose of this study is to determine the factors that contribute to wrong-way crashes, to develop countermeasures to prevent crashes, and to identify locations that can benefit most from implementation of these countermeasures.

Methodology
• Develop a database on wrong-way crashes in Illinois that can be readily available for analysis.
• Determine contributing factors to wrong-way driving.
• Develop countermeasures to prevent crashes.
• Identify at-risk locations for priority implementation of countermeasures.

Technology Transfer and Research Impact
This project is the first comprehensive study in Illinois regarding countermeasures for wrong-way driving and stands to have traffic safety implications beyond Illinois in preventing the accidents and fatalities that accompany these incidents.

The State of Illinois and other agencies in the country are ready to implement the outcomes of this study and address this serious transportation safety concern.

“Wrong-way driving is a factor in approximately one quarter of fatal crashes in Illinois. This project is integral to making Illinois highways safer for everyone who travels them.”

— Priscilla Tobias, IDOT, Bureau of Safety Engineering

This ICT study determines why wrong-way driving occurs and effective countermeasures to prevent it.

Photos courtesy of Huaguo Zhou, Southern Illinois University at Edwardsville.
**Transfer and Development Links in Prestressed Self-Consolidating Concrete Bridge Box and I-Girders (R27-56)**

**Investigators:** Bassem Andrawes, University of Illinois at Urbana-Champaign  
**TRP Chair:** Tom Domagalski, IDOT, Bureau of Bridges and Structures

**Project Summary**
Self-consolidating concrete (SCC) is a workable yet stable concrete that flows easily and consolidates under its own weight. Its unique properties can substantially reduce the labor required to pour complex or heavily reinforced structural members. Over the past decade, the American precast industry has taken significant strides to adopt SCC in commercial projects, though concern about early-age bond behavior has limited the material’s application in prestressed members.

**Research Objectives**
To investigate the bond properties of SCC in full-scale prestressed members, considering the wide array of specimen types and SCC mixture designs utilized in practice. Hence, SCC’s bond strength, including its impact on transfer and development lengths in prestressed members, will be determined.

**Methodology**
- Investigate the performance of seven-wire strands embedded in SCC.  
- Experimentally determine the transfer lengths of prestressing strands in SCC hollow box girders and I-girders.

**Technology Transfer and Research Impact**
The results of this study will prove fundamental to the safe utilization of SCC within the State of Illinois’ prestressed concrete industry. The outcome of this study allows IDOT and other state DOTs to benefit from this research and may set new guidelines for the use of SCC for prestressed structures.

“Understanding how self-consolidating concrete (SCC) bonds with the strands in precast, prestressed, concrete members allows IDOT to develop best practices for using SCC in the construction of bridges built with various types of precast, concrete girders. Using SCC in these types of projects can lead to lower labor costs and provide a more uniform concrete girder.”

— Tom Domagalski, IDOT, Bureau of Bridges & Structures
Evaluating the Compatibility, Durability and Visibility of Pavement Markings on Portland Cement Concrete and Various Asphalt Surfaces (R27-77)

TRP Chair: Kelly Morse, IDOT, Bureau of Materials and Physical Research

Project Summary
IDOT uses a variety of different pavement marking systems depending on pavement type, traffic volume, roadway type, and district preference. This results in a wide range of pavement marking performance. To optimize marking selection, this project focuses on evaluating the performance of various marking types and developing a pavement marking selection guide.

Research Objectives
The purpose of this project is to develop guidelines for portland cement concrete (PCC) and hot-mix asphalt (HMA) pavements.

Methodology
- Investigate best practices for pavement marking.
- Conduct field performance.
- Develop The Pavement Marking Selection Guide.

Technology Transfer and Research Impact
Developed guidelines for pavement marking will allow engineers to make better decisions for selecting more durable pavement markings. Since the successful performance of a marking largely depends on controlling variables during installation, the guide will also include pavement marking procedures. A unified approach to pavement marking will lead to cost savings, less congestion and fewer delays, and rapid construction. Beyond assisting IDOT, the guide will also be used by local Illinois agencies and other state DOTs.

“The Pavement Marking Selection Guide will be a tremendous resource for IDOT and will allow for knowledgeable decision-making regarding the types of marking to use with different pavements. When the best-suited markings are properly installed, IDOT will have less maintenance to perform. Less maintenance means fewer traffic delays for drivers, as well as manpower and financial savings for the department.”

— Kelly Morse, IDOT, Bureau of Materials and Physical Research

Pavement markings are photographed and then pixelated to determine marking effectiveness.
# Completed and Active Projects in FY12

## Construction

<table>
<thead>
<tr>
<th>Project Status</th>
<th>Project Title</th>
<th>Objective</th>
<th>Principal Investigator(s)</th>
<th>TRP Chair</th>
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<tbody>
<tr>
<td>•</td>
<td>R27-49: Documentation of Contract Quantities Training</td>
<td>To implement a course on training and pre-qualifying consultants to perform construction inspections in Illinois.</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>Mike Renner, IDOT, Bureau of Construction</td>
</tr>
<tr>
<td>9/2011</td>
<td>R27-86: An Expert Systems Approach to Construction Scheduling</td>
<td>To develop software to lead engineers through schedule logic design that will improve the accuracy of the time they estimate highway construction projects to take.</td>
<td>Diane Slattery &amp; Kerry Slattery, Missouri State University</td>
<td>Mike Ripka, IDOT, Bureau of Construction Compliance</td>
</tr>
</tbody>
</table>

## Environment

| •              | R27-54: Storm Water Pollution, Erosion & Sediment Control Products Demonstration & Training Center | To develop a methodology to evaluate and demonstrate erosion control projects and approaches. | Prasanta Kalita & Richard Cooke, University of Illinois at Urbana-Champaign | Tom Ripka, IDOT, Bureau of Construction |
| •              | R27-93: Transportation Conformity Particulate Matter Hot-Spot Air Quality Modeling | To develop an approach to quantify the impact on air quality affected by construction projects. | Jane Lin, University of Illinois at Chicago | Walt Zytnieuski, IDOT, Bureau of Design & Environment |
| •              | R27-103: “Green Friendly” Best Management Practices (BMPs) for Interstate Rest Areas—Phase 2 | (Also sponsored by Traffic Operations TAG.) To optimize energy and costs for rest areas and develop best practices for Illinois. | Khaled El-Rayes & Liang Liu, University of Illinois at Urbana-Champaign | Craig Mitckes, IDOT, Bureau of Operations |
| •              | R27-104: Native Vegetation Establishment for IDOT Erosion Control BMPs | To develop improved seed mixes and provide an approach to investigate seeding establishment under new and alternative erosion control best management practices. | Heidi Howard, U.S. Army Corps of Engineers Construction Engineering Research Laboratory & Prasanta Kalita, University of Illinois at Urbana-Champaign | Scott Marlow, IDOT, Bureau of Design & Environment |
| •              | R27-114: Restoration Progress & Flood Disturbance at IDOT Wetland Mitigation Sites | To determine the influence of flood hydrology on plant community development and create metrics for the achievement of performance standards at wetland mitigation sites. | Geoff Pociask, Illinois State Geological Survey & Jeffrey Matthews, Illinois Natural History Survey | Thomas Brooks, IDOT, Bureau of Design & Environment |

- Final report available on the ICT website. Date denotes when project completed.
- Research completed and report forthcoming.
- Research in process. Progress summaries available on the ICT website.
- No report available.
### Environment (continued)

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<tr>
<th>Project Status</th>
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<th>Principal Investigator(s)</th>
<th>TRP Chair</th>
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<tbody>
<tr>
<td>6/2012</td>
<td>R27-SP18: Developing Best Practices (BPs) for Bicycle Trail Construction &amp; Maintenance in Illinois</td>
<td>To develop consistent and economical design guidelines for bicycle trails in Illinois.</td>
<td>Barry Dempsey &amp; Bill Buttlar, University of Illinois at Urbana-Champaign</td>
<td>Todd Hill, IDOT, Bureau of Design &amp; Environment</td>
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### Pavement Design and Management/Materials

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<tr>
<th>Project Status</th>
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<th>Principal Investigator(s)</th>
<th>TRP Chair</th>
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<tbody>
<tr>
<td>6/2012</td>
<td>R27-37: Impact of High RAP Content on Pavement Structural Performance</td>
<td>To quantify the effect of high recycled asphalt pavement (RAP) contents on mixtures, structural, and durability properties.</td>
<td>Imad Al-Qadi &amp; Samuel Carpenter, University of Illinois at Urbana-Champaign</td>
<td>Jim Trepanier, IDOT, Bureau of Materials &amp; Physical Research</td>
</tr>
<tr>
<td>8/2011</td>
<td>R27-38: Development of an Improved Specification for Maximum Plastic Concrete Temperatures</td>
<td>To determine the effects of high plastic temperature on the performance and properties of concrete.</td>
<td>John Popovics and Jeffrey Roesler, University of Illinois at Urbana-Champaign</td>
<td>Derek Parish, IDOT, District 4</td>
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<td></td>
<td>R27-42: Thin, Quiet, and Long-Lasting High Friction Surface Layer</td>
<td>To develop new surface cross sections that utilize locally available aggregate materials as much as possible.</td>
<td>Imad Al-Qadi &amp; Samuel Carpenter, University of Illinois at Urbana-Champaign</td>
<td>Tom Zehr, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td></td>
<td>R27-44-T1: IDOT Pavement Design Course Development</td>
<td>To develop a course outlining Illinois’ pavement design procedures.</td>
<td>Hasan Ozer &amp; Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>Charles Wienrank, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>Project Status</td>
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<td>R27-78: Evaluating the Effects of Various Asphalt Binder Additives/Modifiers on Moisture Sensitivity in HMA</td>
<td>To determine the effect of moisture damage on hot-mix asphalt (HMA) and develop the best approach to control damage using various additives and techniques.</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>Jim Trepanier, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td></td>
<td>R27-79: Designing, Producing &amp; Constructing Fine-Graded Hot-Mix Asphalt (HMA) on Illinois Roadways</td>
<td>To determine the characteristics of fine-graded mixes and their suitability for application in Illinois.</td>
<td>William Buttlar, University of Illinois at Urbana-Champaign; Timothy Murphy, Murphy Pavement; Bill Pine, Heritage Research Group</td>
<td>Matt Mueller, IDOT, Bureau of Materials &amp; Physical Research; Laura Shanley, IDOT, District 6</td>
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<td>R27-100: Best Practices for Implementation of Tack Coat TRP Recommendations</td>
<td>To determine optimum application rate of tack coat in the field—based on research conducted in ICT project R55.</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign; Bill Pine, Heritage Research Group; Enad Mahmoud, Bradley University</td>
<td>Derek Parish, IDOT, District 4</td>
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<td>R27-124: Evaluation of Porous Granular Embankment (PGE) Materials Used as Pavement Subgrade/Granular Subbase</td>
<td>To develop guidelines on the types and properties of PGE materials used as an aggregate/granular subbase.</td>
<td>Erol Tutumluer, University of Illinois at Urbana-Champaign</td>
<td>Sheila Beshears, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>R27-125: Sustainable Aggregates Production—Green Applications for Aggregate By-Products</td>
<td>To investigate and develop innovative methods to utilize product fractions currently being wasted to lower effective costs while extending the productive life of natural aggregate resources.</td>
<td>To Be Determined</td>
<td>David Lippert, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td></td>
<td>R27-128: Testing Protocols to Ensure Performance of High Asphalt Binder Replacement Mixes Using RAP and RAS</td>
<td>To determine and adopt testing protocols, procedures, and specifications that prevent low-temperature and block cracking while properly engineering the resulting hot-mix asphalt when using high amounts of recycled asphalt shingles and pavement.</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>David Lippert, IDOT, Bureau of Materials &amp; Physical Research</td>
</tr>
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<td>R27-129: Implementation of AIMS in Measuring Aggregate Resistance to Polishing, Abrasion, &amp; Breakage</td>
<td>To examine the feasibility of implementing the Aggregate Imaging System (AIMS) along with the Micro-Deval equipment to measure aggregate resistance to polishing, abrasion, and breakage.</td>
<td>To Be Determined</td>
<td>Sheila Beshears, IDOT, Bureau of Materials &amp; Physical Research</td>
</tr>
</tbody>
</table>
# Completed and Active Projects in FY12

## Pavement Design and Management Materials (continued)

### R27-130: Development of Improved Overlay Thickness Design Alternatives for Local Roads
- **Objective**: To analyze the current modified AASHTO, Asphalt Institute, and the newly developed ICT/IDOT FWD testing and backcalculation-based HMA overlay thickness design procedures, and document the estimated construction cost of each design alternative.
- **Principal Investigator(s)**: Erol Tutumluer, University of Illinois at Urbana-Champaign
- **TRP Chair**: Kevin Burke, IDOT, Bureau of Local Roads & Streets

### R27-SP19: Effect of Recycled Asphalt Shingles on IDOT Asphalt Mixtures
- **Objective**: To characterize strength, deformation, and fracture properties of asphalt mixtures made with varying percentages of recycled asphalt shingles.
- **Principal Investigator(s)**: Hasan Ozer, University of Illinois at Urbana-Champaign
- **TRP Chair**: David Lippert, IDOT, Bureau of Materials & Physical Research

## Planning

### R27-48: Travel Demand Modeling for Small & Medium Size MPOs in Illinois
- **Objective**: To establish the framework necessary for development, maintenance, and application of small and medium-size Metropolitan Planning Organization (MPO) urban travel demand models in several communities in Illinois.
- **Principal Investigator(s)**: Paul Metaxatos, University of Illinois at Chicago; Rita Morocoima-Black, Champaign County Regional Planning Commission
- **TRP Chair**: Susan Stitt, IDOT, Bureau of Urban Programming & Planning

### R27-84: Developing Travel Reliability Inventory for Highway Networks
- **Objective**: To develop necessary procedures and computer tools to document the random travel time patterns of highway networks in the Chicago Metropolitan Area.
- **Principal Investigator(s)**: Peter Nelson & John Dillenburg, University of Illinois at Chicago; Marco Nie, Northwestern University
- **TRP Chair**: Jeff Galas, IDOT, District 1

### R27-87: Implementing Pavement Management Systems for Local Agencies
- **Objective**: To develop an implementation manual for pavement management systems (PMS) for local agencies considering this type of planning.
- **Principal Investigator(s)**: Angela Wolters & Katie Zimmerman, Advanced Pavement Technology; Kerrie Schattler, Bradley University
- **TRP Chair**: Kevin Burke, IDOT, Bureau of Local Roads & Streets

### R27-131: Leveraging Traffic and Surveillance Video Cameras for Urban Traffic
- **Objective**: To investigate methods and develop tools for the automated analysis of video from existing networked cameras for traffic monitoring purposes.
- **Principal Investigator(s)**: To Be Determined
- **TRP Chair**: Rob Robinson, IDOT, Bureau of Programming & Planning

### R27-132: Incorporating NEPA into the IDOT and MPO Planning Process
- **Objective**: To identify the institutional strategies that can lead to the use of the National Environmental Policy Act (NEPA) in the planning process for large highway projects.
- **Principal Investigator(s)**: To Be Determined
- **TRP Chair**: Susan Stitt, IDOT, Bureau of Urban Programming & Planning
## Public and Intermodal Transportation

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<tr>
<th>Project Status</th>
<th>Project Title</th>
<th>Objective</th>
<th>Principal Investigator(s)</th>
<th>TRP Chair</th>
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</thead>
<tbody>
<tr>
<td>9/2011</td>
<td>R27-50: Trip Chaining Behavior of Senior Travelers &amp; Applications to Public Transportation Planning</td>
<td>To effectively facilitate transit services targeting senior travelers, to change attitudes toward public transportation, and to develop transportation approaches for an aging population.</td>
<td>Kouros Mohammadian, University of Illinois at Chicago</td>
<td>Chuck Abraham, IDOT, Support Services Section</td>
</tr>
<tr>
<td></td>
<td>R27-51: Guidelines, Site Selection, &amp; Design for Implementing Truck Parking/Rest Facilities in Chicago's South Suburbs</td>
<td>To develop handbooks and materials to support and encourage trucking-related commerce in the areas of I-80/eastern Will County, while alleviating truck parking problems.</td>
<td>Peter Beltemacchi &amp; Laurence Rohter, Illinois Institute of Technology</td>
<td>Chuck Abraham, IDOT, Support Services Section</td>
</tr>
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<td></td>
<td>R27-83: Goods Movement Study in IL: Applications to Freight Transportation and Logistics (Also sponsored by Planning TAG.)</td>
<td>To collect data for developing realistic decision-making models for efficient freight transportation and logistics.</td>
<td>Kouros Mohammadian, University of Illinois at Chicago</td>
<td>Mike Garcia, IDOT, Bureau of High-Speed Passenger Rail</td>
</tr>
<tr>
<td></td>
<td>R27-113: Modeling Seniors’ Activity—Travel Data—Phase 2</td>
<td>To use the dataset from R27-50 to develop key models for analyzing travel/activity planning and scheduling behavior for senior citizens in the Chicago metropolitan area.</td>
<td>Kouros Mohammadian, University of Illinois at Chicago</td>
<td>Amy Welk, IDOT, Support Services Section</td>
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## Safety Engineering

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<th>Principal Investigator(s)</th>
<th>TRP Chair</th>
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<tbody>
<tr>
<td></td>
<td>R27-52: Studying &amp; Minimizing Traffic-Related Work Zone Crashes in Illinois</td>
<td>To develop realistic recommendations for improved work zone layouts and merging techniques that minimize the probable causes of work zone crashes in Illinois.</td>
<td>Khaled El-Rayes &amp; Liang Liu, University of Illinois at Urbana-Champaign</td>
<td>Marshall Metcalf, IDOT, District 6</td>
</tr>
<tr>
<td></td>
<td>R27-90: Investigation of Contributing Factors of Wrong-Way Driving on Freeways</td>
<td>To identify the contributing factors to wrong-way driving on freeways and develop countermeasures to reduce related crashes.</td>
<td>Huaguo Zhou, Ryan Fries, Brent Vaughn &amp; Chiang Lin, Southern Illinois University at Edwardsville</td>
<td>Dave Piper &amp; Priscilla Tobias, IDOT, Bureau of Safety Engineering</td>
</tr>
</tbody>
</table>

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- Research completed and report forthcoming.
- Research in process. Progress summaries available on the ICT website.
Completed and Active Projects in FY12

<table>
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<tr>
<th>Project Status</th>
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<th>Principal Investigator(s)</th>
<th>TRP Chair</th>
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</thead>
<tbody>
<tr>
<td>Safety Engineering (continued)</td>
<td>R27-97: Evaluation of Flashing Yellow Arrows (FYA) for Protected/Permissive Left Turn (PPLT) Control</td>
<td>To determine the effectiveness of flashing yellow arrows at protected/permissive turn signals on traffic safety and operations.</td>
<td>Kerrie Schattler, Bradley University</td>
<td>Randy Laninga, IDOT, District 4</td>
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<td></td>
<td>(Also sponsored by Construction &amp; Traffic Operations TAGs.)</td>
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<tr>
<td>Safety Engineering (continued)</td>
<td>R27-111: Effects of Intersection Right-Turn Lane Design &amp; Skew on Safety &amp; Operations</td>
<td>To determine the impact of right turn lane design on highway safety.</td>
<td>Kerrie Schattler &amp; Mohammad Yamin, Bradley University</td>
<td>Sean Coyle, IDOT, District 4</td>
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<td>(Also sponsored by Traffic Operations TAG.)</td>
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<tr>
<td>Safety Engineering (continued)</td>
<td>R27-116: Investigation of Methods &amp; Approaches for Collecting &amp; Recording Highway Inventory Data</td>
<td>To determine techniques and methodologies for collecting and storing roadway asset data needed to fully support IDOT’s implementation of the recently published Highway Safety Manual.</td>
<td>Huaguo Zhou, Shunfu Hu, Jie Gong, &amp; Mark Grinter, Southern Illinois University at Edwardsville</td>
<td>Rob Robinson, IDOT, Bureau of Urban Planning &amp; Programming; Kim Kolody, CH2MHill</td>
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<td>(Also sponsored by Traffic Operations TAG.)</td>
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<tr>
<td>Safety Engineering (continued)</td>
<td>R27-117: National State Safety Engineers and Traffic Engineers Peer to Peer Workshop</td>
<td>This workshop will focus on the implementation of a variety of safety engineering and traffic operations countermeasures and initiatives including the new federal rules.</td>
<td>Yanfeng Ouyang, University of Illinois at Urbana-Champaign</td>
<td>Priscilla Tobias, IDOT, Bureau of Safety Engineering; Aaron Weatherholt, IDOT, Deputy Director of Highways</td>
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<tr>
<td></td>
<td>(Also sponsored by Traffic Operations TAG.)</td>
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<tr>
<td>Structures/Hydraulics/Geotechnical</td>
<td>R27-26: Free-Cutting Brass Breakaway Couplings</td>
<td>To quantify the energy-absorbing capacity of different shapes of single and multiple brass couplings for use in full-scale crash testing.</td>
<td>Daniel Kuchma, University of Illinois at Urbana-Champaign</td>
<td>Chris Hahin, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>9/2011</td>
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<tr>
<td>Structures/Hydraulics/Geotechnical</td>
<td>R27-55: Instrumentation and Monitoring of “Extreme” Integral Abutment Bridges in Illinois</td>
<td>To instrument and monitor integral abutment bridges for development of new guidelines.</td>
<td>Scott Olson &amp; James Long, University of Illinois at Urbana-Champaign</td>
<td>William Kramer &amp; Gary Kowalski, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>Structures/Hydraulics/Geotechnical</td>
<td>R27-56: Transfer &amp; Development Lengths in Prestressed Self-Consolidation Concrete Bridge Box and I-Girders</td>
<td>To determine transfer and development lengths of prestressing tendons in prestressed box and I-Girders when using self-consolidating concrete (SCC).</td>
<td>Bassem Andrawes, University of Illinois at Urbana-Champaign</td>
<td>Tom Domagalski, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>9/2011</td>
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<td>Structures/Hydraulics/Geotechnical</td>
<td>R27-57: Superiority &amp; Constructability of Fibrous Latex-Modified Concrete Additives for Bridge Deck Overlay</td>
<td>To develop guidelines for the design and construction of high-performance, durable and crack-resistant overlay mixtures with fibrous additives.</td>
<td>Mohammed Alhassan &amp; Suleiman Ashur, Indiana University-Purdue University Fort Wayne</td>
<td>Gary Kowalski, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>R27-69: Improved Design for Driven Piles Based on a Pile Load Test Program in Illinois</td>
<td>To develop more efficient, cost-effective pile designs.</td>
<td>James Long, University of Illinois at Urbana-Champaign</td>
<td>William Kramer, IDOT, Bureau of Bridges &amp; Structures</td>
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<td></td>
<td>R27-70: Calibration &amp; Refinement of Illinois’ Earthquake Resisting System Bridge</td>
<td>To develop refined seismic criteria specific to the needs of Illinois.</td>
<td>James LaFave, Jerome Hajjar, Larry Fahenstock, &amp; Douglas Foutch, University of Illinois at Urbana-Champaign</td>
<td>Daniel Tobias, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>R27-80: Fatigue Testing of Brass Breakaway Couplings</td>
<td>To determine the cost effectiveness of various breakaway couplings.</td>
<td>Grzegorz Banas, University of Illinois at Urbana-Champaign</td>
<td>Chris Hahin, IDOT, Bureau of Materials &amp; Physical Research</td>
</tr>
<tr>
<td></td>
<td>R27-81: Field Performance Evaluations of Illinois Aggregates for Subgrade Replacement &amp; Subbase—Phase II</td>
<td>To verify laboratory testing results from the previous ICT study titled <em>Characterization of Illinois Aggregates for Subgrade Replacement and Subbase</em> using full-scale testing with ATLAS.</td>
<td>Erol Tutumluer, University of Illinois at Urbana-Champaign</td>
<td>Greg Heckel, IDOT, District 6</td>
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<td></td>
<td>R27-82: Strengthening of Bridge Wood Pilings Retrofit for Moment Resistance</td>
<td>To develop enhanced repair and retrofitting techniques for bridges supported on wood pilings through the application of fiber-reinforced polymer (FRP) composites and other suitable materials.</td>
<td>Bassem Andrawes, University of Illinois at Urbana-Champaign</td>
<td>Dan Tobias, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td></td>
<td>R27-88: Bridge Decks: Mitigation of Cracking &amp; Increased Durability</td>
<td>To develop a methodology for building bridge decks with less cracking and increased durability.</td>
<td>Paramita Mondal &amp; Douglas Foutch, University of Illinois at Urbana-Champaign; Riyad Hindi, St. Louis University</td>
<td>Dan Tobias, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td></td>
<td>R27-98: Evaluation of Concrete Cylinder Match Curing &amp; Evaluation of 4” x 8” Cylinders</td>
<td>To determine the variation in concrete curing between chamber and mold, and develop guidelines.</td>
<td>John Popovics, University of Illinois at Urbana-Champaign</td>
<td>Doug Dirks, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>R27-99: Development of Improved Procedures for Determining the Axial Capacity of Drilled Shafts in Illinois Shale</td>
<td>To identify, quantify, and implement methods to better design drilled shaft foundations in Illinois.</td>
<td>Timothy Stark &amp; James Long, University of Illinois at Urbana-Champaign</td>
<td>Riyad Wahab &amp; William Kramer, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>R27-105: Improvement of IDOT Bridge Scour Estimation Method at Sites with Cohesive Soils Using SRICOS Zmax—Phase 2</td>
<td>To optimize the prediction of bridge scouring.</td>
<td>Timothy Straub, U.S. Geological Society</td>
<td>Neil Vanbebber, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>R27-106: Formability of New High Performance Grade 50 Structural Steel</td>
<td>To determine the formability of this new, high performance steel as a base material for structural tubing.</td>
<td>Semyon Vaynman, Northwestern University</td>
<td>Chris Hahin, IDOT, Bureau of Materials &amp; Physical Research</td>
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## Completed and Active Projects in FY12

### Structures/Hydraulics/Geotechnical

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<tr>
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<tbody>
<tr>
<td>•</td>
<td>R27-107: Load Testing of Rapid Deployment Plate &amp; Tube Short-Span Bridge for Country Roads</td>
<td>To build an optimized and efficient structure with rapid deployment plate &amp; tube, &amp; verify in the field.</td>
<td>To Be Determined</td>
<td>Chris Hahin, IDOT, Bureau of Materials &amp; Physical Research; Tom Winkleman, IDOT, Bureau of Local Roads &amp; Streets</td>
</tr>
<tr>
<td>•</td>
<td>R27-115: Analysis of Superstructure of Integral Abutment Bridges</td>
<td>To create more robust abutment bridge superstructures considering the effects of skew, gravity, and thermal loading on integral abutment bridges.</td>
<td>James LaFave &amp; Larry Fahnestock, University of Illinois at Urbana-Champaign</td>
<td>Mark Shaffer, IDOT, Bureau of Bridges &amp; Structures</td>
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<tr>
<td>•</td>
<td>R27-122: Improvement of Driven Pile Installation &amp; Design in Illinois—Phase 2</td>
<td>To develop recommendations for implementing AASHTO LRFD Design Specifications for Driven Piles.</td>
<td>James Long, University of Illinois at Urbana-Champaign</td>
<td>William Kramer, IDOT, Bureau of Bridges &amp; Structures</td>
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### Traffic Operations and Roadside Maintenance

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<tr>
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<tbody>
<tr>
<td>•</td>
<td>R27-75: Clearview Font in Traffic Signs: Assessing IDOT Experiences &amp; Needs</td>
<td>To convert signs to Clearview font, improving legibility and safety.</td>
<td>Hani Mahmassani, Northwestern University</td>
<td>Julia Fox, IDOT, District 1</td>
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<td>•</td>
<td>R27-76: LED Roadway Lighting Evaluation &amp; Field Testing</td>
<td>To investigate cost effectiveness of technological advancements in LED roadway lighting.</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Mark Seppelt, IDOT, Bureau of Design &amp; Environment</td>
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<td>•</td>
<td>R27-91: Evaluation of Traffic Flow Monitoring Technologies: Cicero-Midway Smart Corridor Case Study</td>
<td>To determine the accuracy and merits of traffic monitoring and travel time prediction technologies for arterial surface streets.</td>
<td>Jakob Eriksson, University of Illinois at Chicago</td>
<td>Jeff Galas, IDOT, District 1</td>
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<td>•</td>
<td>R27-94: Performance Evaluation of Snow and Ice Plows</td>
<td>To instrument snow blades and develop a comprehensive performance approach to select snow blades.</td>
<td>Souhail Elhouar &amp; Enad Mahmoud, Bradley University</td>
<td>Tim Peters, IDOT, Bureau of Operations</td>
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<td>•</td>
<td>R27-95: Field Evaluation of Smart Sensor Vehicle Detectors at Intersections &amp; Railroad Crossings</td>
<td>To characterize in-situ performance of vehicle detection systems at railroad grade crossing locations and signalized intersections</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Yogesh Gautam, IDOT, Bureau of Operations; Stan Milewski, Illinois Commerce Commission</td>
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<tr>
<td>Project Status</td>
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<td>R27-110: Training &amp; Implementing Findings of Queue &amp; Users’ Costs in Highway Work Zones—Phase 2</td>
<td>To improve districts’ understanding of a previous ICT study (R27-33).</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Steve Lynch, CH2M-Hill</td>
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<td>R27-120: Evaluating All-Weather Pavement Markings &amp; Lab Methods to Simulate Field Exposure</td>
<td>To evaluate the performance of various all-weather markings and evaluate test methods that may simulate degradation mechanisms in the field.</td>
<td>Neal Hawkins, Iowa State University</td>
<td>Kelly Morse, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td></td>
<td>R27-123: Street Lighting Technologies—LED Street Lighting Evaluation—Phase 2</td>
<td>To investigate issues with LED street lighting uncovered in the first phase of this study.</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Mark Seppelt, IDOT, Bureau of Design &amp; Environment</td>
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<tr>
<td></td>
<td>R27-127: Safety &amp; Efficiency Benefits of Implementing Adaptive Signal Control Technology in Illinois</td>
<td>Adaptive signal control technologies (ASCT) improve traffic flow by continuously adjusting signal timings based on continuous changes in traffic demand. This research will build on previous research and quantify the benefits of ASCT in Illinois.</td>
<td>To Be Determined</td>
<td>Kyle Armstrong, IDOT, Bureau of Operations</td>
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<tr>
<td></td>
<td>R27-SP20: Safety Benefits of Implementing Adaptive Signal Control Technologies (ASCT)</td>
<td>To perform a literature search and review of adaptive signal control technologies (ASCT), which will then be used in R27-127.</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Kyle Armstrong, IDOT, Bureau of Operations</td>
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<td></td>
<td>R27-73: Distance Technology Transfer Course Content Development</td>
<td>To convert up to three IDOT technology transfer classes from a traditional classroom format to a distance learning format.</td>
<td>James Hall, University of Illinois at Springfield and William Buttler, University of Illinois at Urbana-Champaign</td>
<td>Kevin Burke, IDOT, Bureau of Local Roads &amp; Streets</td>
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**Other**

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## Archived Projects

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<td><strong>Archived Environment</strong></td>
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<tr>
<td>● 3/2008</td>
<td>R27-29: Particulate Material (PM) 2.5 &amp; PM 10 Hot Spot Analysis: Midwest Peer Exchange</td>
<td>Jane Lin, University of Illinois at Chicago</td>
<td>Walt Zyznieuski, IDOT, Bureau of Design &amp; Environment</td>
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<tr>
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<tr>
<td><strong>Archived Pavement Design and Management/Materials</strong></td>
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<tr>
<td>● 12/2009</td>
<td>R27-1: Characterization of Illinois Aggregates for Subgrade Replacement and Subbase</td>
<td>Erol Tutumluer, University of Illinois at Urbana-Champaign; Abbas Butt, Engineering Research International</td>
<td>Riyad Wahab, IDOT, Bureau of Bridges &amp; Structures</td>
</tr>
<tr>
<td>● 3/2008</td>
<td>R27-3: Design &amp; Concrete Material for Ultra-Thin Whitetopping Procedures</td>
<td>Jeffrey Roesler, University of Illinois at Urbana-Champaign; Anastasios Ioannides, University of Cincinnati</td>
<td>James Krstulovich, IDOT, Bureau of Materials &amp; Physical Research</td>
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<tr>
<td>● 3/2009</td>
<td>R27-12: Cold In-Place and Full-Depth Recycling with Asphalt Products (CI and FDRwAP)</td>
<td>Marshall Thompson &amp; Samuel Carpenter, University of Illinois at Urbana-Champaign</td>
<td>Kevin Burke, IDOT, Bureau of Local Roads &amp; Streets</td>
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<tr>
<td>Project Status</td>
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<tr>
<td>12/2008</td>
<td>R27-41: Performance of I-57 Recycled Concrete Pavement</td>
<td>Jeffrey Roesler, University of Illinois at Urbana-Champaign</td>
<td>Mark Gawedzinski, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>9/2007</td>
<td>R44: Self-Consolidating Concrete Replacement and Subbase</td>
<td>David Lange &amp; Leslie Struble, University of Illinois at Urbana-Champaign</td>
<td>James Krstulovich, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>6/2006</td>
<td>R53: Concrete Distress Identification</td>
<td>Leslie Struble, University of Illinois at Urbana-Champaign</td>
<td>Brian Pfeifer, IDOT, Bureau of Materials &amp; Physical Research</td>
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<tr>
<td>12/2008</td>
<td>R57: Evaluation &amp; Implementation of Improved CRCP &amp; JCPC Design</td>
<td>Jeffrey Roesler, University of Illinois at Urbana-Champaign</td>
<td>Amy Schutzbach, IDOT, Bureau of Materials &amp; Physical Research</td>
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<tr>
<td>12/2008</td>
<td>R59: Evaluation of Pavement Damage Due to New Tire Designs</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>Mark Gawedzinski, IDOT, Materials &amp; Physical Research</td>
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## Archived Pavement Design and Management Materials

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<tbody>
<tr>
<td>9/2010</td>
<td>R27-SP3, SP5, SP7, SP9, and SP 13: Profile Equipment Verification (PEV)—FY06–FY09</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>David Lippert &amp; LaDonna Rowden, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>3/2010</td>
<td>R27-SP14: Texas-AASHTO Retroreflective Sign Sheeting Specifications</td>
<td>Liang Liu, University of Illinois at Urbana-Champaign</td>
<td>Kelly Morse, IDOT, Bureau of Physical Materials &amp; Research</td>
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<tr>
<td>12/2008</td>
<td>R27-SP11: Analysis of I-57 Recycled CRCP Cores</td>
<td>Jeffrey Roesler, University of Illinois at Urbana-Champaign</td>
<td>Mark Gawedzinski, IDOT, Bureau of Materials &amp; Physical Research</td>
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<tr>
<td>6/2011</td>
<td>R27-SP17: Warm-Mix Asphalt Study</td>
<td>Imad Al-Qadi, University of Illinois at Urbana-Champaign</td>
<td>Tom Zehr, IDOT, Bureau of Materials &amp; Physical Research</td>
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## Archived Planning

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<td>Principal Investigator(s)</td>
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<td>●</td>
<td>R27-5: Bus Riding on Shoulders</td>
<td>Piyushimita Thakuriah &amp; Paul Metaxatos, University of Illinois at Chicago</td>
<td>Chuck Abraham, IDOT, Support Services Section</td>
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<td>8/2010</td>
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<td>●</td>
<td>R27-15: Regional Warehouse Trip Production</td>
<td>John DeVries &amp; Kristin Nance, Roosevelt University</td>
<td>Chuck Abraham, IDOT, Support Services Section</td>
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<td>10/2008</td>
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<td>●</td>
<td>R27-16: Truck Parking Facilities Program Design</td>
<td>Laurence Rohter &amp; Peter Beltemacchi, Illinois Institute of Technology</td>
<td>Chuck Abraham, IDOT, Support Services Section</td>
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<td>4/2008</td>
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<td>●</td>
<td>R27-17: Effectiveness of Transit Strategies Targeting Elderly People</td>
<td>Kouros Mohammadian &amp; Piyushimita Thakuriah, University of Illinois at Chicago</td>
<td>Chuck Abraham, IDOT, Support Services Section</td>
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**Archived Safety Engineering**

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<tbody>
<tr>
<td>●</td>
<td>R56: Speed Photo Enforcement</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Priscilla Tobias, IDOT, Bureau of Safety Engineering</td>
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<tr>
<td>●</td>
<td>R27-2: Nighttime Construction: Evaluation of Lighting Glare for Highway Construction in Illinois (Also sponsored by Traffic Operations TAG.)</td>
<td>Khaled El-Rayes &amp; Liang Liu, University of Illinois at Urbana-Champaign; Mostafa Elseifi &amp; Marwa Hassan, Bradley University</td>
<td>Dennis Huckaba, IDOT, Bureau of Safety Engineering</td>
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<td>●</td>
<td>R27-18: Crash Data Analysis &amp; Engineering Solutions for Local Agencies</td>
<td>Yanfeng Ouyang, University of Illinois at Urbana-Champaign with Zongzhi Li, Illinois Institute of Technology</td>
<td>Kevin Burke, IDOT, Bureau of Local Roads &amp; Streets</td>
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<td>●</td>
<td>R27-20: Develop Safety Performance Functions for Illinois</td>
<td>Yanfeng Ouyang, University of Illinois at Urbana-Champaign</td>
<td>Dave Piper, IDOT, Bureau of Safety Engineering</td>
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<td>R27-21: Alternative Intersections—Roundabout Evaluation and Design</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Sean Coyle, IDOT, District 4</td>
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<td>●</td>
<td>R27-40: Safety Impacts of Shoulder Attributes in Illinois</td>
<td>Zongzhi Li, Illinois Institute of Technology</td>
<td>Dave Piper, IDOT, Bureau of Safety Engineering</td>
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<tr>
<td>●</td>
<td>R27-67: National Safety Performance Function (SPF) Summit</td>
<td>Yanfeng Ouyang, University of Illinois at Urbana-Champaign</td>
<td>Priscilla Tobias, IDOT, Bureau of Safety Engineering</td>
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<td>12/2009</td>
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<td>●</td>
<td>R27-SP1: Media Cable Scanning Tour</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Dave Piper, IDOT, Bureau of Safety Engineering</td>
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● Final report is available on the ICT website. Date denotes when project completed.
# Archived Projects

## Archived Structures/Hydraulics/Geotechnical

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<th>Status</th>
<th>Project Title</th>
<th>Principal Investigator(s)</th>
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<tr>
<td>12/2008</td>
<td>R54: Precast Deck Beam Lifting Loops</td>
<td>Daniel Kuchma, University of Illinois at Urbana-Champaign</td>
<td>Brian Pfeifer, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>8/2009</td>
<td>R27-25: Modification of IDOT Integral Abutment Design Limitations and Details</td>
<td>Scott Olson &amp; James Long, University of Illinois at Urbana-Champaign</td>
<td>William Kramer, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>10/2008</td>
<td>R27-35: Simple Cost-Effective Scour Sensor</td>
<td>Farhad Ansari, University of Illinois at Chicago</td>
<td>Dave Copenbarger, IDOT, District 6</td>
</tr>
<tr>
<td>9/2008</td>
<td>R27-36: Transfer/Development Length of Prestressing Tendons in AASHTO I-Girders Using Self-Consolidated Concrete</td>
<td>Bassem Andrawes, University of Illinois at Urbana-Champaign</td>
<td>Tom Domagalski, IDOT, Bureau of Bridges &amp; Structures</td>
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<td>3/2006</td>
<td>R27-SP2: Chicago Bridge Deck &amp; Bridge Piers</td>
<td>Imad Al-Qadi &amp; John Popovics, University of Illinois at Urbana-Champaign</td>
<td>David Lippert, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>5/2008</td>
<td>R27-SP7: Non-Destructive Evaluation of Reinforced Concrete Structures</td>
<td>Imad Al-Qadi &amp; John Popovics, University of Illinois at Urbana-Champaign</td>
<td>David Lippert, IDOT, Bureau of Materials &amp; Physical Research</td>
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<td>5/2009</td>
<td>R27-SP12: DeKalb County Bridge Collapse Investigation</td>
<td>Bassem Andrawes, Jerome Hajjar &amp; Scott Olson, University of Illinois at Urbana-Champaign</td>
<td>Jim Klein, IDOT, Bureau of Local Roads &amp; Streets</td>
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## Archived Traffic Operations and Roadside Maintenance

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<td>12/2006</td>
<td>R27-4: Radiation Detection Pilot Program</td>
<td>William Dunn, University of Illinois at Urbana-Champaign</td>
<td>Tom Korty, IDOT, Bureau of Operations</td>
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<tr>
<td>8/2008</td>
<td>R27-22: Regional Transportation Data Management &amp; Archiving System</td>
<td>Yanfeng Ouyang, University of Illinois at Urbana-Champaign</td>
<td>Dave Johnson, IDOT, Bureau of Operations</td>
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<tr>
<td>Project Status</td>
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<td>12/2008</td>
<td>R27-31: Wind-Powered Electrical Systems for Highway Facilities</td>
<td>Patrick Chapman, University of Illinois at Urbana-Champaign</td>
<td>Dave Johnson, IDOT, Bureau of Operations</td>
</tr>
<tr>
<td>8/2010</td>
<td>R27-33: Queue and Users’ Cost in Highway Work Zones</td>
<td>Rahim Benekohal, University of Illinois at Urbana-Champaign</td>
<td>Marshall Metcalf, IDOT, District 6; Aaron Weatherholt, IDOT, Deputy Director of Highways</td>
</tr>
<tr>
<td>6/2008</td>
<td>R27-43: Utah LTAP GIS Software Replication</td>
<td>Yanfeng Ouyang, University of Urbana-Champaign</td>
<td>Kevin Burke, IDOT, Bureau of Local Roads &amp; Streets</td>
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<td>6/2008</td>
<td>R27-SP10: Online Training Course Prototype</td>
<td>James Hall, University of Illinois at Springfield</td>
<td>Kevin Burke, IDOT, Bureau of Local Roads &amp; Streets</td>
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<tr>
<td>9/2010</td>
<td>R27-SP15: Snowplow Simulator Training Study</td>
<td>Thomas O’Rourke, University of Illinois at Urbana-Champaign</td>
<td>Dave Johnson, IDOT, Bureau of Operations</td>
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**Other Archived Projects**

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<th>Principal Investigator(s)</th>
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<tbody>
<tr>
<td>11/2009</td>
<td>R27-SP8: Wireless Internet on Trains</td>
<td>Ramavarapu Sreenivas, University of Illinois at Urbana-Champaign</td>
<td>Mark Kinkade, IDOT, Bureau of Information Processing</td>
</tr>
<tr>
<td>12/2008</td>
<td>R27-SP16: Evaluation of Horizontal Directional Drilling (HDD)</td>
<td>Youssef Hashash, University of Illinois at Urbana-Champaign</td>
<td>Terri Petersen, IDOT District 7</td>
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