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**ILLINOIS CENTER FOR TRANSPORTATION**

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**PROJECTS**

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**PROJECT SPOTLIGHT**

**Characterizing Illinois Aggregates**

ICT characterized the strength, stiffness, and fabrication behavioral free-pulverized and pulverized aggregates. Research on aggregate domains and unconfined gravel, commonly used in areas for subgrade replacement and subbase. The study used both laboratory and field performance to develop aggregate thickness requirements with comparisons with aggregate properties to modify and improve the thickness requirement curve in IDOT's Subgrade Stability Manual.

**NEWS/EVENTS**

Research Ideas Due June 30; New Needs Posted

ATREL Hosts Clarive Reinvestment Commission

ICT Redesigns its Project Status Page

ICT Continues to Grow and Diversification

Investigator Awards for Spring 2010

Student Awards for Spring 2010

**CALENDAR**

June 7, 2010 International Workshop on Energy and Environment in

[Read More](#)



 ILLINOIS

 Illinois Department of Transportation





The Illinois Center for Transportation (ICT) is an innovative research partnership between the Illinois Department of Transportation (IDOT) and the University of Illinois. The ICT builds on the experience of renowned experts in transportation and related fields by providing the appropriate tools and support required for objective research. The 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 from taxpayer dollars.

## **1 DIRECTOR'S REPORT**

Director Imad Al-Qadi summarizes the positive impacts from ICT's first five years and more than 120 research projects.

## **3 ICT ADMINISTRATION**

Meet the administrative team behind ICT's innovative research that includes ICT staff, the ICT executive committee, and technical advisory groups.

## **4 THE ICT INVESTIGATORS**

The ICT research team includes 84 investigators from a diverse array of universities, private consulting firms, and governmental agencies.

## **6 ICT'S HISTORY OF GROWTH AND DIVERSIFICATION**

Created in 2005, the ICT builds on several decades of collaboration between IDOT and the University of Illinois. Statistics on ICT's research, including funds, growth, outsourcing, and diversification are presented graphically.

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Research at ICT is supported by world class facilities that include the Advanced Transportation Research and Engineering Laboratory (ATREL) on 47 acres of the former Chanute Air Force Base.

## **12 THE RESEARCH PROCESS**

From an idea to the final report: Learn how a good idea turns into real results and how to get involved in ICT's research.

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Samples of ICT's completed research are presented by focus area with tangible outcomes highlighted.

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ICT actively publicizes its research through its Web site, newsletter, publications, presentations, conferences, short courses, and webinars.

## **26 AWARDS**

The ICT congratulates its investigators, staff, and students on several awards and honors received during the past year.

## **27 RESEARCH PROJECT APPENDIX**

The first 122 funded ICT projects are listed by focus area, including the project name, a short description of the research, research outcome, investigator(s), technical review chairperson, and status.

## **47 COMMONLY USED ACRONYMS**

Several commonly used acronyms are defined.

**“The tremendous growth and success of the center has given us the opportunity to create relationships with more than ten other universities through outsourcing to match new research needs with the most specialized investigators. Overall, 84 investigators from 20 agencies contribute to ICT’s success.”**

—Imad Al-Qadi



We, at the Illinois Center for Transportation (ICT), are pleased to present this summary report of our accomplishments for the fiscal year 2009-2010. Since its inception five years ago, ICT has grown to become one of the leading transportation centers in the nation. In 2005, the center started with 12 projects; nine of which were pavement projects, and all of the investigators were from the UIUC transportation group. Today, ICT has a total of 122 projects that represent true diversity in transportation research.

The tremendous growth and success of the center has given us the opportunity to create relationships with more than ten other universities through outsourcing to match new research needs with the most specialized investigators. Our research collaboration also involves several UIUC departments and colleges, governmental agencies, and private consultants. Overall, 84 investigators from 20 agencies contribute to ICT’s success. Our research of the past five years has helped support more than 105 young, talented graduate students in addition to many undergraduate students, and these numbers are ever-increasing.

We have continued our push towards increased outreach to allow the outcome of our research to be widely used and implemented. Some of our recent initiatives include developing distance learning technologies for IDOT and increasing enrollment in the documentation of contract quantities certification classes. We also sponsor and help plan several transportation conferences such as BCR2A, T&DI Congress, T.H.E., and the Illinois Bituminous Paving Conference. In addition, this past year, we improved our reporting and accountability with regards to the status of ongoing projects including online updates of project tasks.

*continued on next page*

## ICT AT A GLANCE

- 122 research projects approved to date
- 63 completed projects
- \$18 million investment from IDOT and FHWA
- 84 researchers contributing
- 108 students supported
- 11 universities participating
- 47-acre facility
- 67,400 square feet of laboratories
- Largest moveable full-scale pavement testing facility in the country
- Housed within in the U.S. #2 nationally ranked civil engineering program\*

\* according to U.S. News and World Report in March 2010

*continued from previous page*

ICT is also excited about introducing a new development at UIUC this year – a research and training site to demonstrate erosion, sediment, and storm water control practices suitable to Illinois conditions. This project is just one example of our significant level of involvement in environmental issues. ICT's focus on sustainability in transportation is also evident from our projects on recycled pavements, air quality standards, and green-friendly management practices for Interstate rest areas, among others.

As you browse through this report, it is clear that our staff, facilities, researchers, and students are second to none. This is evident in the recognitions our investigators receive, the offers of employment our students enjoy, and most of all the implementation and far-reaching impacts of our research.

I have no doubt that through groundbreaking research by our talented researchers and students, ICT will maintain its status as a leading international transportation center and will continue to serve the state of Illinois, the nation, and the world.

Thank you for taking the time to learn more about the ICT. Please visit our Web site regularly for more information about our research activities, how to get involved, and to view all the final research reports and updated progress reports for our current projects.



### STAFF SPOTLIGHT:

**Leslie Elble** is the assistant to the ICT director. Invaluable to Dr. Imad Al-Qadi, she oversees the daily administrative needs of the center and assists with

special projects such as planning the annual Bituminous Paving Conference. "Much of my job consists of others duties as assigned. Sometimes Imad is hard to keep up with, but I've been doing it for almost six years now."

Sincerely,  
Imad L. Al-Qadi, PhD, PE  
Founder Professor of Engineering, UIUC  
Director, ICT and ATREL

## STAFF AND ADMINISTRATION

### ICT Staff

Behind ICT's innovative research are the ICT staff who work together to deliver a full range of support services to the research team.

The ICT staff gathered for a retreat on November 6, 2009, to discuss the opportunities, vision, and future direction of the ICT.



The ICT staff includes, as pictured above at the retreat, back row from left to right: Imad Al-Qadi (Director), Sam Carpenter (Assistant Director), Josh Houston (Systems Engineer), Jim Meister (Research Engineer), Jeff Kern (Research Engineer); middle: Dave King (Resource & Policy Analyst); front: Lori Carpenter (Communication Coordinator), Leslie Elble (Assistant to the Director), and Leslie Sweet Myrick (Editor). Not pictured: Mary Fries (Lecturer).

### Illinois Department of Transportation (IDOT) Involvement

Staff at the Illinois Department of Transportation (IDOT) have an active role in the administrative and research activities of the ICT. Several IDOT staff serve on or support the ICT executive committee, which oversees the research program by reviewing and selecting individual research projects. Projects are screened to ensure that the research is innovative, diverse, cost-effective, and serves the needs of both the state of Illinois and the Illinois Department of Transportation.

### ICT Executive Committee

Christine Reed, Director of Highways  
Bill Frey, Acting Committee Chairman,  
Deputy Director of Highways  
Jon-Paul Kohler, FHWA Representative  
Brian Pfeifer, FHWA Representative  
Imad Al-Qadi, ICT Representative

Additionally, the director of each IDOT division and office or his/her appointee is invited to attend each executive committee meeting.

The following IDOT employees support the activities of the ICT executive committee:

David Lippert, Bureau Chief, Materials and Physical Research  
Amy Schutzbach, Engineer of Physical Research  
Patricia Broers, Technical Research Coordinator

### TAG Chairs and BMPR Representatives

Also critical to the ICT research activities are the IDOT staff who serve on the Technical Advisory Groups (TAGs), which review, prioritize, and recommend projects to the ICT Executive Committee, and who represent the Bureau of Materials and Physical Research (BMPR) in the TAGs.

#### STRUCTURES/HYDRAULICS/GEOTECHNICAL

TAG Leader: Tom Domagalski  
BMPR Representative: Mark Gawedzinski  
ICT Representative: Scott Olson

#### PAVEMENT DESIGN & MANAGEMENT/MATERIALS

TAG Leader: David Lippert  
BMPR Representative: Mark Gawedzinski  
ICT Representative: Erol Tutumluer

#### TRAFFIC OPERATIONS & ROADSIDE MAINTENANCE

TAG Leader: Aaron Weatherholt  
BMPR Representative: Patricia Broers  
ICT Representative: Kerry Schattler

#### SAFETY ENGINEERING

TAG Leader: Priscilla Tobias  
BMPR Representative: Patricia Broers  
ICT Representative: Zhongzhi Li

#### ENVIRONMENT

TAG Leader: Barbara Stevens  
BMPR Representative: Joe Vespa  
ICT Representative: Jane Lin

#### PUBLIC TRANSPORTATION/MULTI-MODAL

TAG Leader: Chuck Abraham  
BMPR Representative: Patricia Broers  
ICT Representative: Kouros Mohammadian

#### PLANNING

TAG Leader: Vacant  
BMPR Representative: Patricia Broers  
ICT Representative: Hani Mahmassani

#### CONSTRUCTION

TAG Leader: Tim Kell  
BMPR Representative: Charles Wienrank  
ICT Representative: Nora El-Gohary

*For more information on the ICT research process, please see page 13.*



## ICT INVESTIGATORS



Mohammad Alhassan  
Purdue University



Imad Al-Qadi  
Director of ICT, UIUC



Bassam Andrawes  
UIUC



Farhad Ansari  
UIUC



Suleiman Ashur  
Purdue University



Grzegorz Banas  
UIUC



Peter Beltemacchi  
IIT



Rahim Benekohal  
Director of Traffic  
Operations Lab (TOL),  
UIUC



William Buttler  
UIUC



Richard Bruce  
Missouri State  
University



Samuel Carpenter  
Associate Director  
of ICT, UIUC



Patrick Chapman  
UIUC



Roger Chen  
Northwestern  
University



Samer Dessouky  
UT at San Antonio  
(formerly UIUC)



Jon DeVries  
Roosevelt University



John Dillenburg  
UIUC



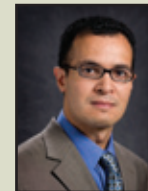
William Dunn  
UIUC



Carmine Dwyer  
ARA



Khaled El-Rayes  
UIUC



Mostafa Elsefi  
Louisiana State University  
(formerly Bradley  
University)



Larry Fahnestock  
UIUC



Ryan Fries  
SIUE



Jerome Hajjar  
Northeastern University  
(MA) (formerly UIUC)



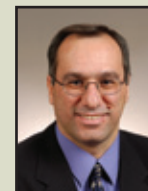
James Hall  
UIS



Youssef Hashash  
UIUC



Marwa Hassan  
LSU (formerly Bradley  
University)



Riyadh Hindi  
Bradley University



Anastasios Ioannides  
University of Cincinnati



Audrey Ishii  
U.S. Geological Survey



Prasanta Kalita  
UIUC



Diego Klabjan  
Northwestern University  
(formerly UIUC)



Daniel Kuchma  
UIUC



James LaFave  
UIUC



David Lange  
UIUC



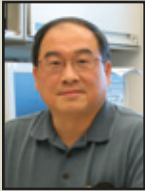
Zongzhi Li  
IIT

# **Organization Key:**

APTech: Applied Pavement Technology, Inc.  
 ARA: Applied Research Associates, Inc.  
 ERI: Engineering & Research International, Inc.  
 HERE: Heckel Engineering, Research, and Education, Inc.

IIT: Illinois Institute of Technology  
 LADCO: Lake Michigan Air Directors Consortium  
 LSU: Louisiana State University  
 SIUE: Southern Illinois University at Edwardsville  
 RPC: Regional Planning Commission

UIUC: University of Illinois at Urbana-Champaign  
 UIC: University of Illinois at Chicago  
 UIS: University of Illinois at Springfield  
 UT: University of Texas



Chiang Lin  
SIUE



Jie Lin  
UIC



Liang Liu  
UIUC



James Long  
UIUC



James Meister  
UIUC



Kouroos Mohammadian  
UIC



Paramita Mondal  
UIUC



Timothy Murphy  
Murphy Pavement Tech.



Peter Nelson  
UIC



Yu (Marco) Nie  
Northwestern University



Scott Olson  
UIUC



Tom O'Rourke  
UIUC



Yanfeng Ouyang  
UIUC



John Popovics  
UIUC



Jeffery Roesler  
Associate Director of ATREL, UIUC



Laurence Rohter  
IIT



Jennifer Sharpe  
U.S. Geological Survey



Kerrie Schattler  
Bradley University



Dianne Kay Slattery  
Missouri State (formerly SIUE)



Kerry Slattery  
Missouri State (formerly SIUE)



David Soong  
U.S. Geological Survey



Ramavarapu Sreenivas  
UIUC



Douglas Steele  
ARA



Timothy Straub  
U.S. Geological Survey



Leslie Struble  
UIUC



Marshall Thompson  
UIUC



Erol Tutumluer  
UIUC



Brent Vaughn  
SIUE



William Vavrik  
ARA



Angela Wolters  
APTech



Huaguo Zhou  
SIUE



Kathryn Zimmerman  
APTech

## **Not Pictured**

Abbas Butt  
ERI  
Richard Cooke  
UIUC  
Douglas Foutch  
UIUC  
Christopher Hart  
UIUC

Laura Heckel  
HERE  
Michael Koerber  
LADCO  
Hani Mahmassani  
Northwestern University  
Paul Metaxatos  
UIC

Rita Morocoima-Black  
Champaign Co. RPC  
Kristin Nance  
Roosevelt University  
Scott Peters  
Consultant  
Kurt Smith  
APTech

Piyushimita Thakuriah  
UIC  
Thomas Van Dam  
APTech  
Ming Wang  
UIC

## ICT'S HISTORY OF GROWTH AND DIVERSIFICATION

### Significant Events

**1941:** The Illinois Department of Transportation (IDOT) and the University of Illinois establish a cooperative agreement and begin collaborating on their individual strengths and common interests in transportation research.

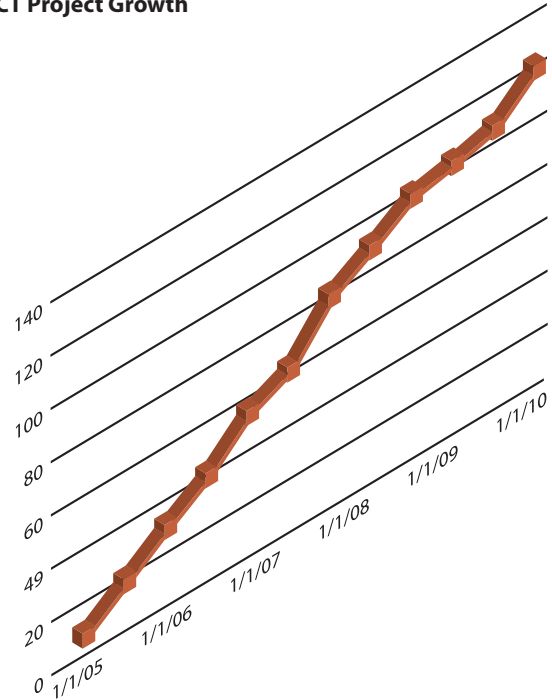
**July 2005:** IDOT and the University form an official research partnership, the ICT, which is created with an initial three-year agreement of \$8.8 million with IDOT providing a majority of its \$6.6 million share through federal highway dollars specifically allocated for research purposes. The University provides most of the local match of \$2.2 million to get the program underway. Of the initial 12 ICT projects, which are mainly a continuation of the existing cooperative agreement, nine are pavement-related and all are performed by investigators from the University's Champaign-Urbana campus.

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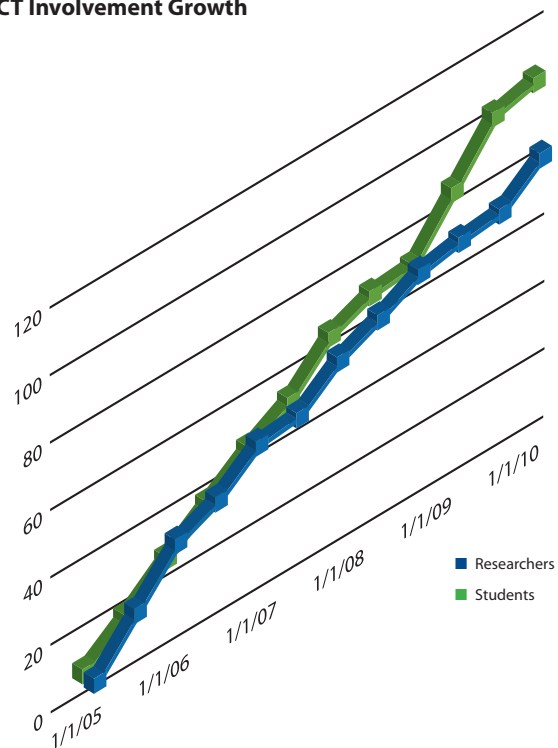
**July 2008:** A second three-year agreement between IDOT and ICT provides \$15 million for additional research through 2011. At the time the second agreement is signed, ICT has 68 projects in progress, 14 projects completed, and has greatly expanded the scope of its research.

**Present:** As outlined in the agreements, ICT continues its research with 122 approved projects that show great diversity, both in research topic and investigator outsourcing. ICT has collaborated with investigators from 11 universities as well as government agencies and private firms and has completed 61 projects with final reports published and posted to the ICT Web site and research findings making a true impact in Illinois and beyond.

### ICT Project Growth



### ICT Involvement Growth



### STAFF SPOTLIGHT:



**Sam Carpenter** serves as ICT associate director. Dr. Carpenter is a Professor Emeritus of the UIUC Department of Civil and Environmental Engineering. He previously served as the

Director of the Illinois Cooperative Highway and Transportation Research Program, which was an agreement between UIUC and IDOT prior to the inception of ICT. He has served as the PI on several projects for IDOT both prior to and following the inception of ICT.



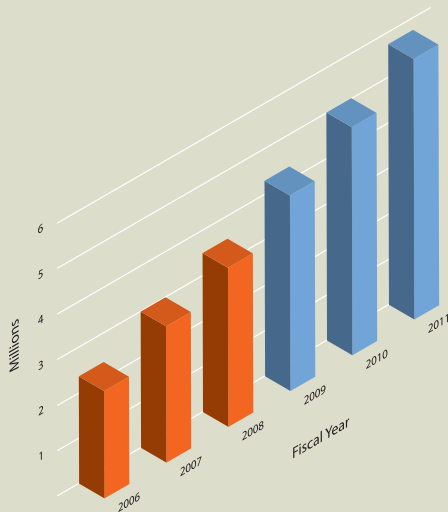


#### STAFF SPOTLIGHT:

**Dave King** is the ICT research and policy analyst. He oversees ICT's research funds, the center's overall budget, and the projects' progress. He also has been instrumental to ICT's increased outsourcing of new projects (to investigators outside of UIUC). "Lately we have been outsourcing about half of our projects, so facilitating the RFP process has been a large part of my job this past year."

#### ICT Funding Growth

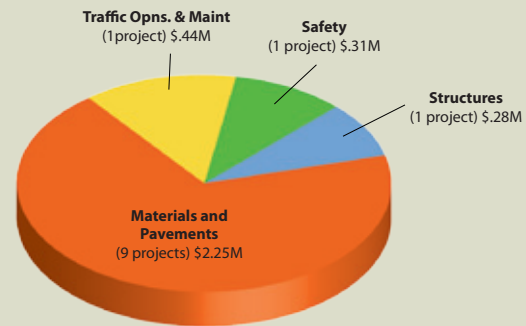
ICT continues to show remarkable growth with significantly increased IDOT funding each fiscal year.



#### ICT's Diversified Research Portfolio

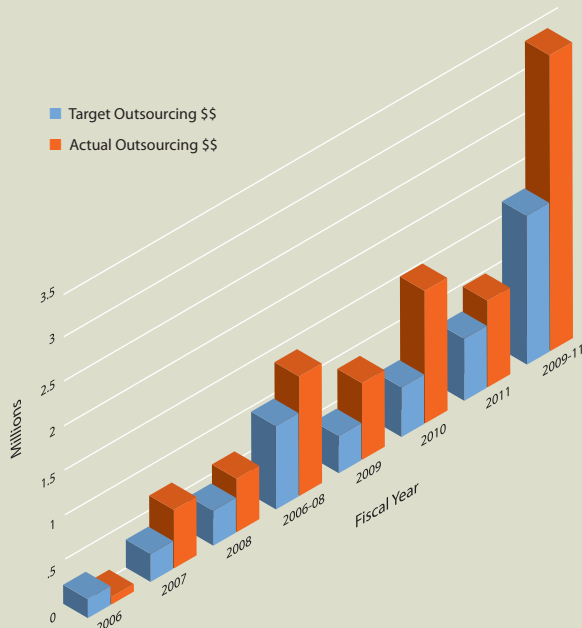
Since its inception, ICT has greatly expanded the scope of its research to cover additional focus areas, including environment, planning, construction, renewable energy, and public transportation. Although it is still a core focus area, pavement research no longer defines ICT.

#### ICT in 2005

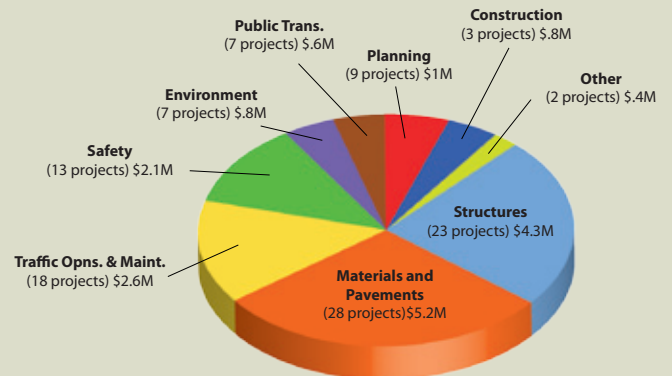


#### Outsourcing to Non-UI Researchers

A unique feature of ICT is that, even though it is administered by the University of Illinois at Urbana-Champaign, a portion of the funding is outsourced to schools outside of the University of Illinois system. This outsourcing develops cooperative relationships with other universities and exposes more students to transportation research. In recent years, ICT has significantly exceeded its target goals for outsourcing.



#### ICT Projects Added 2005–2010



#### Participating Universities and Institutes

Bradley University  
 Illinois Institute of Technology  
 Missouri State University  
 Northwestern University  
 Purdue University  
 Roosevelt University  
 Southern Illinois University at Edwardsville

University of Cincinnati  
 University of Illinois at Chicago  
 University of Illinois at Springfield  
 University of Illinois at Urbana-Champaign







## ICT FACILITIES AND RESOURCES

ICT is headquartered in a state-of-the art facility at the Advanced Transportation Research and Engineering Laboratory (ATREL). The ATREL complex is located on 47 acres just 15 miles north of the UIUC Campus. The complex includes 67,400 square feet of laboratories, continuing education classrooms, office space, a technical library, and a computer facility. To sustain ICT's leadership in transportation research, ATREL is staffed and equipped to accommodate the investigation of a wide range of projects from basic science and theoretical research to full-scale field-testing and transportation infrastructure evaluation including pavements, bridges, railroad traffic, and transportation systems.

### ATREL Receives IDOT Approval for HMA and Aggregate Testing

In early 2010, ATREL received IDOT approval for several tests. The IDOT Bureau of Materials and Physical Research (BMPR) inspected the HMA and aggregate testing labs and reviewed the equipment and testing procedures to ensure that they



comply with the relevant ASTM and AASHTO specifications found in the IDOT Manual of Test Procedures for Materials. ATREL was inspected as per the same standards expected for all

IDOT district labs. The labs were found to meet the specifications, and ATREL was approved.

Additionally, ATREL participates in the Round Robin Uniformity Study for HMA conducted by IDOT. The study requires each participating lab to perform testing on a known mix. The 2010 Round Robin testing included HMA volumetrics, gyratory compaction, TSR, ignition oven, and aggregate gradation. The biennial inspections and Round Robin testing provide IDOT with a means to ensure that contractors, consultants, districts, and ATREL are consistent with laboratory procedures and results.

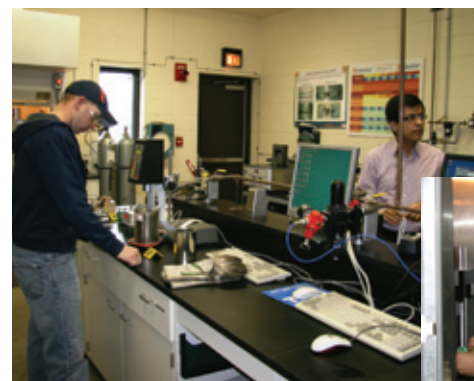
### ATREL's Ever-growing Capabilities

ATREL is constantly upgrading its capabilities; just a sample of its improvements in the past year include:

- An additional hydraulic system to perform fracture and fatigue testing under extremely cold temperatures.
- Increased oven capacity to handle larger volumes of asphalt work.
- Deeper penetrating ground radar equipment (200 mhz) to better detect voids and anomalies in soils.
- Upgraded performance testing of construction materials, including shear testing, indirect tension fatigue testing, and direct tension fatigue testing.
- Rail tie loading machine to cyclically test ties under critical loading conditions.
- Improved sieving equipment to expedite automatic aggregate fractionization for mix design projects.
- A new Hamburg wheel tracking device for evaluating the permanent deformation and moisture sensitivity of various construction materials.
- A recently installed large temperature control system for ATLAS to maintain desired temperature during testing.

### ATREL Laboratories

Large and small-scale material samples can be tested in several labs at ATREL using state-of-the art equipment, some of which were developed at ATREL. One laboratory area houses several servo-hydraulic and pneumatic systems for soil, granular materials, concrete, as well as HMA testing that includes simple performance, complex modulus, indirect tension, creep, four-point bending fatigue, and disk-shaped compact tension, among others.



### STAFF SPOTLIGHT:



**Jim Meister** is a research engineer. He supports graduate students and ICT investigators with their research by making sure they have the right equipment; it is in proper working order; and they have a safe environment for their work. He is also in charge of ATREL building maintenance. "No day is the same at ATREL, and that's fine with me."



ATREL houses SuperPave™ binder testing equipment, a linear rolling wheel compactor, 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. Another laboratory area has 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. This frame and soil containment box can test specimens approximately 8 ft. x 16 ft. Previous tests have included reinforced concrete slabs cut from an interstate pavement, static and fatigue of airfield concrete slabs, fiber reinforced concrete slabs, and two-lift concrete slabs.



#### Accelerated Transportation Loading Assembly (ATLAS)

The Accelerated Transportation Loading ASsembly (ATLAS) can evaluate full-scale transportation systems subject to real life traffic and environmental loads. The system is capable of simulating aircraft, truck, or rail traffic distributions, testing all types of pavement systems, and applying load levels exceeding that of highway and airfield limits. ATLAS can be covered by a moveable structure that controls the effects of daily temperature and moisture changes on the pavement section being studied. It also has data acquisition systems for instrument data collection. ATLAS can apply up to 6,000 repetitions per day, and it is equipped with insulated environmental-control aluminum panels designed to provide a constant temperature for the top 2 inches of pavement.



#### Traffic Operations Laboratory

The Traffic Operations Laboratory (TOL) houses equipment to evaluate traffic signal components and fiber optic communications, offices, technology transfer classrooms, testing areas, and a 17-foot high bay area. TOL's extensive collection of traffic signal control hardware, including controllers, detector units, and conflict monitors, provides a valuable resource for hands-on instruction and research.



#### STAFF SPOTLIGHT:



**Jeff Kern** is a research engineer. He facilitates the testing required for various ICT projects. He also works actively with both IDOT and representatives from industry to ensure that the project needs are met. He serves on the research team for several ICT projects and works behind the scenes for many others. "I really enjoy working with the students and am proud to be a part of the important research being done here."

## VISITORS TO ATREL

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

Akzo Nobel Surface Chemistry  
 Amstead Rail  
 Applied Pavement Technology, Inc.  
 Applied Research Associates, Inc.  
 Chanute Air Force Base Reuse Commission Group  
 Colas  
 CXT  
 Federal Highway Administration  
 Harbin Institute of Technology, China  
 Illinois Department of Transportation  
 Illinois Toll Authority  
 MTS  
 Road Science, LLC  
 Ruhl Forensic  
 Southeast University, China  
 Transportation Technology Center, Inc. (TTCI), a subsidiary of Association of American Railroads  
 Unit Rail  
 University of Birmingham, United Kingdom  
 University of Cagliari, Italy  
 University of Kansas  
 University of Parma, Italy  
 University of Warsaw, Poland

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1. ICT Director Imad Al-Qadi gives a tour of the ATREL facility to the Chanute Air Force Base Reuse Commission Group during their visit in May 2010.
2. Transportation faculty, staff, and students, along with their families, gathered at ATREL in December 2010 to celebrate the holiday season and the year's accomplishments.
3. Professors Emeritus Ernie Barenberg and Barry Dempsey enjoy the ATREL holiday party.
4. ICT Director Imad Al-Qadi poses in the lab with visitors from China's Harbin Institute of Technology in February 2010.

## ...FROM IDEA TO FINAL REPORT

The ICT prides itself on diversity, both of its research portfolio and in the affiliations of its investigators. Although the center is based at the University of Illinois, ICT research is conducted in collaboration with experts at many other universities, research agencies, and private consulting firms.

The ICT Intergovernmental Agreement with IDOT requires that approximately 11% of contract amounts be contracted outside the University of Illinois at Urbana-Champaign to other public or private universities, research institutions, and specialty consultant firms.

As a testament to its commitment to diversity, ICT consistently exceeds this outsourcing requirement, and in Fiscal Year 09-10, ICT outsourced approximately 25% of its funded research.

To maximize the variety of research considered and selected, the expertise of its investigators, the efficiency of the research process, and the quality of the research results, ICT operates by the procedures outlined on the next page.

### ICT IMPLEMENTS VIRTUAL MEETINGS

Although ICT Principal Investigator Jeff Roesler is spending the current academic year in Santiago, Chile as a Fulbright Scholar, this distance proved itself no detriment to regular technical review panel (TRP) meetings for an ongoing ICT project.

The TRP for Roesler's ICT project R27-61, Mechanistic-Empirical Design, Implementation & Monitoring for Rigid Pavements, "met" on October 22, 2009, using Adobe ConnectPro to include participants from Champaign-Urbana, Rantoul, Springfield, and Santiago, Chile.

Although it is not a replacement for valuable face-to-face meetings, this software is now available to ICT committees and associates, when appropriate, to cut down on travel time and costs, and for instances like the above when a face-to-face meeting is not possible.

### STAFF SPOTLIGHT:



**Lori Carpenter** is the ICT communication coordinator. She serves as liaison between ICT and IDOT. Lori monitors the status of ICT projects and documents the TRP meetings. "I've had several investigators tell me that my involvement in the research process allows them to focus more on their research rather than administrative tasks."



### 1. Call for Research Ideas

Twice annually, the eight ICT Technical Advisory Groups (TAGs) identify specific transportation topics or focus areas as priorities for new ICT research. ICT then posts the TAG suggestions on its Web site and invites potential researchers and IDOT staff to submit specific research ideas. Although ICT encourages research ideas based on the priorities the TAGs identified, research ideas on any transportation-related topic are considered. Those who wish to suggest a specific research topic can download the Proposed Research Idea Form from the ICT Web site. The deadlines for these submissions are generally January 31 and June 30.

### 2. Funding of Projects

After the Call for Research Ideas deadlines, the TAGs review the research ideas submitted in their respective subject areas and prioritize them for presentation to the ICT Executive Committee for funding recommendations. The ICT Executive Committee meets twice annually, and during these meetings, the committee reviews the project priorities of the eight TAGs. The Executive Committee makes the final decision on which research projects are funded.

### 3. Selection of the Project Technical Review Panel

For each new project, IDOT appoints a Technical Review Panel (TRP) to oversee and guide the research. Members can be IDOT employees, FHWA representatives, local government representatives, private contractors, or private citizens. The TRP chair is generally an IDOT employee.

### 4. Investigator Selection

Once a project is funded, ICT and the relevant TRP determine who serves as the Principal Investigator(s). ICT can select a Principal Investigator (PI) from one of the University of Illinois' three campuses. Alternatively, ICT can solicit proposals from researchers outside the University of Illinois' campuses.

### 5. Requests for Proposals

For projects not directly assigned to an investigator, ICT solicits formal research proposals. These Requests for Proposals (RFPs) are widely advertised and posted on the ICT Web site semi-annually. In fiscal year 2009-2010, ICT advertised eight RFPs with a total value in excess of \$1.5 million.

### 6. Evaluation of Proposals

The appropriate TAG (or subcommittee from the TAG) evaluates all proposals and makes a recommendation to ICT for award of the research.

### 7. Research Process

Once a researcher is selected for a project (either selected by the ICT or via RFP), he or she is asked to work with the TRP to prepare a work plan and budget.

The PIs keep accurate records of the nature of their work performed and data analysis, and they submit quarterly reports on their research progress.

### 8. Completed Projects

After the PI(s) completes his or her research and is ready to disseminate the findings and conclusions, the PI works with the TRP and an ICT editor to finalize his or her project report so that the research findings are presented clearly and the report's formatting is consistent with ICT requirements.

ICT considers a project as complete when the final research report is published and posted on the ICT Web site.\*

When a project is complete, ICT publicizes the research findings as appropriate, and IDOT implements the research findings as appropriate. In some instances, IDOT has asked ICT to develop and present short courses to facilitate the transfer of the findings and new technologies to appropriate state and local transportation officials.

\*In some rare instances, IDOT may request the findings remain confidential for a period of time or IDOT may determine that the findings/ conclusions are so specialized that they do not warrant a public report. In these special cases, the findings or conclusions are usually disseminated to the specific IDOT personnel who would be affected or interested.

**Technical Advisory Group (TAG):** The TAG is a subcommittee of the Executive Committee with expertise in a specific research area. These groups review, prioritize, and *recommend* projects to the ICT Executive Committee. ICT currently has eight standing TAGs, and other ad hoc TAGs can be added as needed.

**Executive Committee:** The Executive Committee is chaired by the IDOT Director of Highways (or the director's designee) and is comprised of the ICT Director, the Directors of the Offices and Divisions of IDOT, and representatives from the Federal Highway Administration (FHWA). This committee reviews and *selects* research projects.

**Principal Investigator (PI):** The lead researcher on an ICT project.

**Technical Review Panel (TRP):** A committee specifically created to oversee and guide an ICT research project on behalf of IDOT. Members are appointed based upon their expertise to ensure there is sufficient subject expertise and diversity on each panel to assist and guide the ICT researcher(s). The TRP is responsible for reviewing and approving the research work plan, providing regular feedback to the researchers about the research, and reviewing and approving the project's final report.

# IMPACT OF RESEARCH

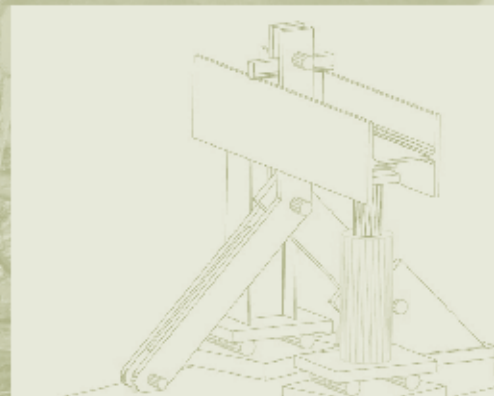


**This section presents a summary and, most importantly, the impact of completed ICT research projects.**

**Please note that this section highlights only a selected number of the diverse and groundbreaking research ICT has completed. For a comprehensive list of complete and ongoing projects, turn to the end of this report.**

**The showcased projects on the following pages are organized into the research areas that correspond to IDOT Technical Advisory Groups.**

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## Speed Photo Enforcement (R56)

**Background:** Between 6,000 and 7,000 crashes occur in Illinois' work zones annually. Contrary to popular belief, motorists are more likely to get hurt in work zones than workers; motorists account for approximately 85% of the total injuries and fatalities in work zones. To encourage slower, and therefore safer, driving in work zones, Illinois enacted the Automated Traffic Control Systems in Highway Construction or Maintenance Zones Act in 2004. This act authorized the use of the speed photo enforcement (SPE) van in work zones for the first time in the United States. However, although this method of SPE has been used in Illinois since 2004, its effects had until recently gone unstudied.

**Research:** ICT researchers compared the effects of the SPE on mean speed and degree of speeding to the conditions without police presence and to some variations of police presence in the work zone. They studied the effects of different treatments on cars and trucks separately, free flowing and general traffic stream vehicles, and on vehicles in the median (passing lane) and in the shoulder lane (driving lane). In most cases, the investigators found that the SPE was just as effective in reducing drivers' speeds as having a police car with its flashing lights off present in the work zone. The SPE lowered the average speed of the general traffic stream below the speed limit in all cases.

**Impact:** This study proved SPE as a feasible and effective technique to reduce drivers' speeds in work zones. These findings are significant considering it is not feasible for police officers to be able to stop all speeding vehicles or be in all locations at all times. As a result of this research project, IDOT and the Illinois State Police have expanded the use of SPE, and it is now used in all IDOT districts across the state.

PI: Ray Benekahal



Deployment station inside photo enforcement vehicle.



Photo enforcement vehicle.

## NOTABLE

The results of ICT's Safety Performance Function (SPF) research proved so helpful in Illinois that ICT introduced the concept of SPFs to a wider audience at a national summit in late July 2009 (R27-67). A total of 89 attendees representing safety engineers, data managers, agency statisticians or local university researchers affiliated with state DOTs and FHWA division offices, AASHTO, TRB, key researchers involved in the development of *SafetyAnalyst* and *Highway Safety Manual* (HSM), and researchers and developers from the private sector attended the summit, which facilitated the exchange of ideas and best practices related to SPFs.

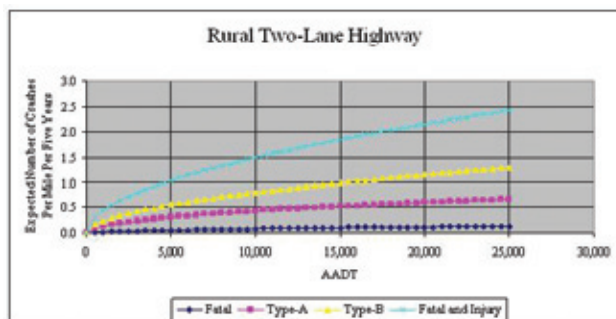
PI: Yanfeng Ouyang





## Safety Performance Functions (R27-20) and Crash Data Analysis (R27-18)

**Background:** Risks of driving can be associated with driver reactions, weather conditions, roadway geometries, or a combination of several factors. Even though all roadways have some inherent level of risk, some roadway sites (e.g., segments and intersections) are considered more hazardous than others. In the past, agencies would measure the rate of crashes to traffic volumes, use civilian input, or measure the absolute number of crashes at a location to declare whether a location was a safety concern. However, these techniques tend to be subjective and inaccurate. To reduce traffic-related fatalities and severe injuries, IDOT needed to better understand how traffic volumes (and other risk exposure variables) affect the crash frequency.



Graphical representation of segment SPF.

**Research:** ICT research developed Illinois-specific statistical models referred to as Safety Performance Functions (SPFs) that provide realistic and accurate predictions of crash frequencies as a function of traffic volume and roadway geometries over a roadway network (segments or intersections). The models were then incorporated into ICT's analysis of crash data (R27-18) as a method to screen sites. ICT then developed several tools to allow Illinois' local agencies to plan safety-based highway improvements, including a searchable database of local road crashes by location that permitted analysis of local crash data and the development of useful reports.

**Impact:** Analyzing sites through the SPF methodology, as opposed to previous techniques, produces consistent, unbiased, and objective results. The comparisons allow IDOT and local agencies to better understand which locations, along their networks, are a potential safety concern, and therefore spend their efforts accordingly. IDOT will use the findings of these models in its comprehensive highway safety plan. Further, the research enables local agencies to construct data-driven roadway improvements to reduce the number and severity of crashes in their domains.

PIs: Yanfeng Ouyang and Zongzhi Li

See Research Appendix for additional completed SAFETY ENGINEERING research.

1. Please select a time range

From  to  (Format: mm/yyyy)

2. Please select a county

3. Please select a township

4. Please select a roadway functional class

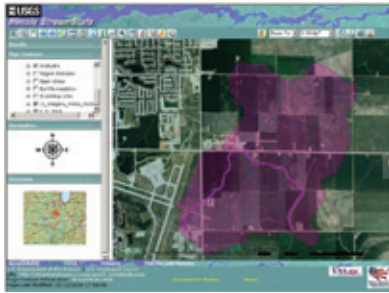
5. Please select a route number

**1074 (109 crashes)**

| CISCrashID | ICN       | DistrictCode | CrashReportCountyCode | CrashReportCounty | CrashReportCityCode | CrashReportCity |
|------------|-----------|--------------|-----------------------|-------------------|---------------------|-----------------|
| 1158855    | 050130202 | 5            | 10                    | Champaign         | 5845                | Urbana          |
| 881676     | 050237536 | 5            | 10                    | Champaign         | 5845                | Urbana          |
| 762087     | 050242957 | 5            | 10                    | Champaign         | 5845                | Urbana          |
| 1187632    | 050322510 | 5            | 10                    | Champaign         | 5845                | Urbana          |

User-interface for crash query.

## Illinois Streamstats (R27-6)



USGS Illinois Streamstats website.

### Background:

Streamflow statistics, such as peak-discharge estimates for floods of various frequencies (flood quantiles), are used widely in engineering and scientific applications such

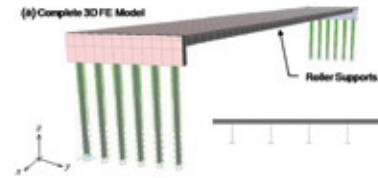
as determining flood plains, designing hydraulic structures including bridges and culverts, and the planning and management of the state's water resources to protect water quality and supply. While representative, site-specific streamflow records are essential for deriving reliable flow statistics, region-wide information provides greater confidence in the statistics and enables estimates where streamflow records are not available. A national Web-based application that includes tools for computing watershed characteristics and some national databases was developed as an outcome of partnering with the United States Geological Survey (USGS). However, the GIS layers and the rural flood-frequency equations for Illinois needed to be implemented in order to utilize the application effectively.

**Research:** To develop Illinois StreamStats (ILSS), the investigators prepared GIS-data layers and Web-based Extensible Markup Language (XML) programming, populated a stream-flow-statistics database, evaluated and adjusted the basin characteristics determined from ILSS, and evaluated the flood-peak quantiles from ILSS. The team reported that ILSS appears to be an accurate, reliable, and effective tool for estimating flood-quantile and determining a consistent set of basin characteristics.

**Impact:** The implemented ILSS can be accessed on the Web at <http://streamstats.usgs.gov/> by selecting the "State Applications" hyperlink and choosing "Illinois" from the pull-down menu. This Web program reduces the time and resources, and consequently the costs required to estimate flows for bridge and culvert waterway openings and to determine basin characteristics and flood quantiles for other water resources studies.

PIs: David Soong, Audri Ishii, and Jennifer Sharpe

## Modifying the Design of Integral Abutment Bridges (R27-25)



3D structural model used in IAB study.

**Background:** Integral abutment bridges (IAB) are generally easier to construct, cost less, and require less maintenance than similar bridges with joints.

Accordingly, several highway departments, including IDOT, are increasingly using IABs. However, the current guidelines that apply to IABs have several gaps and are unclear in several cases.

**Research:** ICT performed two-dimensional and three-dimensional geotechnical and structural engineering modeling of IABs based on IDOT designs to understand the current design demands and explore methods to expand IABs. The investigators then developed instrumentation plans for monitoring IABs to verify the modeling results. Finally, ICT developed and documented rational guidelines and limitations for IABs as well as construction and monitoring plans for instrumenting existing and/or planned IABs.

**Impact:** As a result of this research, IDOT has developed and adopted specific length, skew, and foundation guidelines for IABs. As a result, the traveling public will experience a smoother roadway ride and reduced construction, while IDOT will enjoy lower repair costs and improved guidance on what sites or treatments are necessary to utilize an IAB.

PIs: Scott Olson and James Long

See the Research Appendix for additional STRUCTURES, HYDRAULIC, AND GEOTECHNICAL research.

### NOTABLE

In the first four months of 2010, Illinois StreamStats (ILSS) had the third highest number of Web requests on the main national StreamStats server that hosts 13 states' Streamstats sites. ILSS statistics show 1,533 determinations of flow quantile estimates for this period. In the past, determining peak-discharge estimates for floods of various frequencies (flood quantiles) could take from hours to weeks, depending on the size of the watershed. Now the watershed delineation, basin characteristics extraction, and flood frequency computations can all be completed by "pointing and clicking." ILSS can be accessed at <http://streamstats.usgs.gov> and clicking on State Applications.



## Evaluation of 3-D Laser Scanning for Construction Applications (R27-30)

**Background:** The use of laser scanning equipment to produce three-dimensional representations of objects and surfaces is a technology that can be used for monitoring highway and bridge construction activities. Although the equipment cost remains high compared to the electronic total stations currently used to measure earthwork quantities, the laser scans quickly produce a collection of data points, or “point clouds,” which can be processed to provide three-dimensional models, accurate to within a few millimeters (0.01 feet). Taking measurements in this manner could increase field productivity and improve the integration of design and construction survey data. However, to establish the accuracy of this new method, data obtained using laser scanning technology must be compared to data obtained using traditional methods.

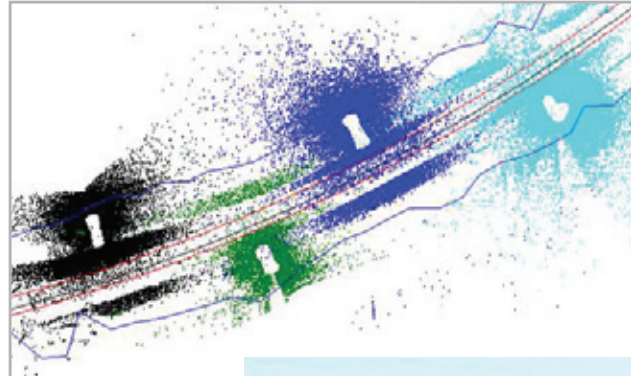
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**Research:** The investigators performed laser scans on several construction projects in IDOT District 8 and analyzed the data to verify the comparability of laser scan results with currently specified construction measurement and quantity determination methodology. The researchers examined ways to integrate design drawings and geospatial project data with construction measurements and developed recommended procedures for implementing the technology for specific construction applications. The investigators also evaluated the use of the laser scanner for real-time monitoring of settlement of adjacent structures during pile driving operations. For these evaluations, the scanner was set up near a job site, and scans were taken periodically to plot changes in ground elevation and movement of structures. The investigators also developed software that provides a user-friendly graphical interface for viewing, manipulating, and using scanner data.

**Impact:** This research shows that laser scanning technology can effectively be used to reduce the number of man hours required by more traditional survey methods. Specifically, it gave IDOT confidence in the use of laser scanning technology so it may be implemented as another tool for performing the labor and time intensive task of generating earthwork models to calculate pay quantities.

PIs: Dianne and Kerry Slattery

See the Research Appendix for additional CONSTRUCTION research.



Coverage from scans taken to develop complete data for modeling earth berms along Governors Parkway in Edwardsville, IL.



Scan of damaged bridge girders on Illinois Route 162 bridge over I-55/70, Troy, Illinois.

## NOTABLE

The Illinois Transportation Archaeological Research Program (ITARP) used this laser technology validated by ICT to provide a survey for an archaeological dig on IDOT's Mississippi River Bridge project. The \$640 million Mississippi River Bridge project will result in the first bridge built connecting downtown St. Louis and southwestern Illinois in more than 40 years.



Three-dimensional rendering of new bridge courtesy of the Missouri Department of Transportation.



## Expansive Characteristics of Recycled Materials (R27-27)

**Background:** Reclaimed asphalt pavement (RAP) is reprocessed hot mix asphalt (HMA) pavement material containing asphalt and aggregates. A viable solution for disposing of large quantities of RAP is to incorporate them into base and subbase applications for highway construction. However, RAP materials may contain an expansive aggregate such as steel slag that IDOT does not allow in the pavement substructure layers because steel slag aggregates may contain free lime and magnesia that may cause expansion when reacted with water.

**Research:** The investigators tested selected RAP materials and related virgin aggregates for expansion potential and conducted petrographic and chemical analyses for the materials that showed unsuitably high expansion characteristics which raised concerns about pavement performance. The RAP materials had much lower tendencies to expand when compared to high expansion potentials of some virgin steel slag aggregates. This is most likely due to an effective asphalt coating around the aggregate, which prevents any significant ingress of water into the aggregate. Using the results of these analyses, the researchers developed a test method for the expansion of RAP aggregates and determined the expansive properties for RAP that may be used as pavement base materials in Illinois, the maximum acceptable level of expansion for different RAP aggregate types, properties and blending proportions with virgin aggregates, and the effects that RAP materials may have on pavement performance.

**Impact:** The developed test methods for the expansion of RAP aggregate and the determination of the maximum acceptable level of expansion for different RAP aggregate types, properties, and blending proportions, will help IDOT expand its use of RAP which will cut costs while benefiting the environment. The findings also offer the opportunity to develop improved specifications and blending guidelines with virgin aggregates that will accommodate RAP materials which will result in optimized RAP selection and resource utilization, reduced construction costs, and improved sustainability.

Temperature reading, Ph values, and specimen expansion values during testing.



### NOTABLE



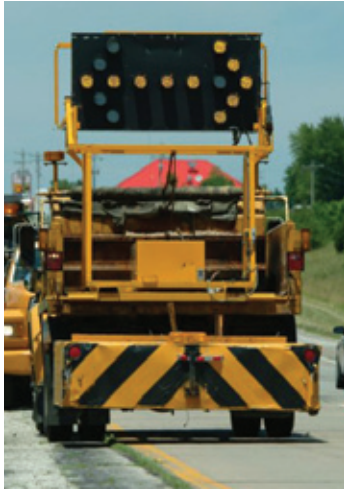
Vázquez from Hormigones Artigas of Montevideo, Uruguay and engineers from the Portland Cement Institute of Argentina). During the same visit, Roseler also gave a short course on UTW to Hormigones Artigas and the Uruguay Ministry of Public Works.

A recently constructed ultra-thin whitetopping (UTW) project in Montevideo, Uruguay was designed and specified based on the new IDOT UTW procedure finalized as a result of ICT's R27-3, Design & Concrete Material Requirements for Ultra-Thin Whitetopping. PI Jeffrey Roseler visited the project in person (shown in photo with Esteban

PIs: Erol Tutumluer and John Popovics

See the Research Appendix for additional PAVEMENT DESIGN & MANAGEMENT/MATERIALS research.

## Safer Rolling Lane Closures – Phase II (R27-72)



**Background:** Rolling lane closures are a common traffic control technique in work zones; they consist of a convoy of traffic protection vehicles equipped with warning lights and arrowboards that alert drivers to the presence of work crews and guide them to the adjacent lane until they have safely passed the work zone. However, a danger of rolling closures is that their

moving nature does not allow for the placement of barricades between the work crew and the adjacent open traffic lane. Previous ICT research on rolling lane closures (R27-32) identified specific hazards that make moving lane closures inherently dangerous and recommended specific design features (such as truck spacing) on driver behavior.

**Research:** The investigators facilitated a series of large group and expert panel meetings throughout Illinois to present the Phase I findings, receive feedback from traffic control professionals regarding their observations, and identify possible solutions for improving the safety of moving lane closures. The topics of discussion included the hazards involved with moving lane closures, possible solutions, and traffic control standards. The feedback gained helped validate and shape the investigators' specific recommendations to enhance IDOT's existing standards for moving lane closures.

**Impact:** Phase II of this research developed specific recommendations to enhance existing standards for moving lane closures. The implementation of this research could help reduce the numerous fatalities that occur in highway work zones.



A rolling lane closure moves through an interstate work zone.

### NOTABLE



ICT's initial research (R27-32) on safer rolling lane closures continues to generate lots of interest. The project was profiled in the May/June 2010 issue of *Traffic Technology International*, the winter 2010 issue of *CEE Magazine*, and will be included in the 2010 *Transportation Research Record: Journal of the Transportation Research Board*.

PIs: Douglas Steele and William Vavrik

See the Research Appendix for additional TRAFFIC OPERATIONS AND ROADSIDE MAINTENANCE research.

### Air Quality Summit (R27-68)

**Background:** Transportation and air quality planning are closely linked, and regional, state, and local transportation agencies face several challenges as they attempt to comply with federal air quality standards.



Participants gather after morning hike.

**Activity:** The ICT sponsored the Midwest Transportation Air Quality Summit in fall 2009. The 64 participants (from federal, state, regional, and local transportation and air agencies) of this conference discussed state implementation planning activities for new air quality standards, mobile source emission inventories (and the U.S. Environmental Protection Agency's new MOVES emissions model), highway project-level analyses, current diesel engine programs, climate change, mobile source air toxics, and ongoing mobile source-related research studies.

**Impact:** States including Illinois have new information, tools, and support from federal, state and local air quality officials as they work together to comply with federal air quality standards, reduce the impacts of hazardous air pollutants, and address climate change.

*PI: Michael Koerber*

*See the Research Appendix for additional ENVIRONMENTAL research.*



View from the top of the bluff at Pere Marquette State Park. Image courtesy of Walter Zyzniwski, IDOT.

### NOTABLE

The Erosion Control Research and Training Center (ECRTC) was established on the UIUC campus (as part of ICT project R27-54) to demonstrate erosion, sediment, and storm water control practices suitable to Illinois conditions. This new center will be used for hands-on training, to demonstrate proper installation and evaluation techniques, and to initiate research to assess the applicability of erosion control and best practices for storm water management for relevant IDOT site conditions. In collaboration with UIUC's Department of Agricultural and Biological Engineering, ICT will administer short courses to disseminate the outcome of the center's research.

*PIs: Prasanta Kalita and Richard Cooke*





ICT maximizes the impact of its research through outreach activities, which include a regularly updated Web site, a quarterly electronic newsletter, webinars, and short courses. Additionally, ICT actively publishes its research in a wide variety of publications and presents its research at numerous national and international conferences and events throughout the year.



## Web site Receives High Traffic

The ICT Web site reported impressive and increased traffic for the year. The statistics included:

- Approx. 15,000 page views per weekday
- Visitors from 188 countries
- During May 2009: 8,445 visitors
- During March 2010: 12,905 visitors

## Project Status Page Redesigned

For each ICT project, you may view a color-coded task status bar on the ICT Web site. These pages were recently redesigned to more clearly show updates to task progress. Other recent back-end changes to the ICT Web site have resulted in more timely data as well as more convenient reporting methods for ICT investigators.



## ICT Develops Courses for Distance Learning

Decreasing staff and increasing travel costs have limited IDOT's ability to deliver technical training in a timely and accessible manner. Online course delivery is a possible solution to provide the necessary training at lower costs and increased convenience. Therefore, ICT is developing course content



The gradation course is filmed at ATREL.

for distance learning in an online environment for several key, high-benefit IDOT technology transfer courses and short courses.

An initial short-term project (R27-SP10) analyzed the costs, benefits, and feasibility of delivering electronic and online training to meet IDOT's needs and deemed this type of training to be beneficial and feasible. The team then developed several products for a flagger training course that served as a prototype to address technical and implementation issues for other future courses.



ICT's technical review panel for distance learning meets to discuss the project's progress.

During Spring 2010, a half-day gradation course was filmed during spring 2010 in the ATREL lab. IDOT personnel demonstrated the proper techniques for aggregate sampling, splitting, and testing. The video was narrated by Scott Hughes from IDOT and will be used for technology transfer to inform technicians of the proper aggregate testing procedures.

The flagger course will soon be deployed, and other courses deemed to provide significant benefits by being converted to a distance learning format, including work zone safety will soon be developed.

Implementing distance training for IDOT will effectively deliver specialized technical content while enabling individuals to take courses anytime and anywhere through the Internet and/or other electronic media. IDOT staff will realize benefits from increased accessibility and flexibility, and IDOT will save money through reduced travel costs.

The PIs for these projects (R27-SP10 and R27-73) are James Hall and William Buttlar.

### Documentation Training Enrollment Climbs

All consultants who perform construction inspection (Phase III) work for IDOT must take and pass the Documentation of Contract Quantities class administered by ICT. In 2009-2010, ICT offered 15 three-day classes (two more than last season) that were attended by 569 attendees (up from 417 last season). This course, led by ICT instructor Mary Fries, assures well-trained, prequalified consultants to perform construction inspection in Illinois. This 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.



### IAB Research Presented at ACEC-Illinois/IDOT Bridge Seminars

ICT Investigator Scott Olson presented two seminars to the American Council of Engineering Companies (ACEC) during its IDOT Bridge Seminars in Lisle and Springfield. Both seminars attracted between 200 and 250 attendees including IDOT bridge engineers, consulting engineers (both those working for IDOT and those hoping to get work from IDOT), inspectors, and local IDOT engineers. The seminar provided education on the benefits of integral abutment bridges (IABs), introduced the latest IDOT/ICT research on their performance, and updated the attendees on IDOT's efforts to expand IAB use in the state.



ICT PIs Steele and Vavrik brief the expert panel on the research team's findings and recommendations prior to discussion.

### ICT Hosts Expert Panel to Discuss Safer Rolling Lane Closures

ICT investigators Douglas Steele and William Vavrik presented their initial research on rolling lane closures (R27-32) to

an expert panel consisting of a diverse group of professionals from across the country to provide peer review. The participants included representatives from Texas Transportation Institute, Virginia Transportation Research Council, the Maryland State Highway Administration, FHWA, IDOT, Illinois Tollway, and industry. The meeting took place on August 4, 2009, at the Illinois Tollway headquarters in Downers Grove. Overall, the meeting provided excellent feedback and discussion on this

### STAFF SPOTLIGHT:



**Josh Houston** is ICT's network analyst. He is responsible for ICT's Web development, server administration, and database management. "This past year I focused a lot of my time on developing the tools for our training classes and distance learning, including registration systems, databases to track enrollment, and course content."

topic that is of interest to many state agencies. The feedback helped validate and shape the investigators' specific recommendations to enhance IDOT's existing standards for moving lane closures.

### Modeling Group Created for Metropolitan Planning Organizations

As part of project R27-48, ICT investigators Paul Metaxatos and Rita Morocoima-Black created the Illinois Model Users Group (ILMUG). This group includes representatives from several Metropolitan Planning Organizations (MPOs) including several Regional Planning Commissions from throughout Illinois. The ILMUG will facilitate the implementation of the travel demand models being developed to help small and medium size communities assess transportation system performance, analyze deficiencies, and develop long range plans.

### ICT Hosts Multi-State Peer Exchange on Material Testing

To benchmark Illinois material testing in relation to other states and determine needed courses of action, ICT investigator Tim Murphy planned a peer exchange as part of project R27-62. Thirty-five attendees from across the country joined the exchange which convened on October 19-21, 2009, in Springfield. Several states, including Illinois, Indiana, Missouri, and New Hampshire presented and discussed their quality assurance programs. ICT will use the information gathered to analyze and compare quality assurance versus risk for all materials

*continued on next page*



Attendees of the materials testing peer exchange gather for a group photo.

used in road building throughout Illinois, the Midwest, and nationally. After hours, the out-of-town guests were shown some architectural and historical sites of Springfield, including the Dana-Thomas house designed by Frank Lloyd Wright, and given a private tour of the state capital.

### Illinois Bituminous Paving Conference Turns 50



The ICT planned and sponsored the 50th Annual Illinois Bituminous Paving Conference, which convened on December 9, 2009, at the iHotel and Conference Center in Champaign. More than 200 attendees gathered for the

compact one-day program that included the latest technical information and review actual field reports in the area of hot-mix asphalt construction.



ICT Director Imad Al-Qadi welcomes attendees to 50<sup>th</sup> Annual Illinois Bituminous Paving Conference.



Marshall Thompson discusses his ICT project on cold-in-place recycling with asphalt products.

### Research Published

A sampling of the publications, websites, and events where ICT research has been published, featured, or presented:

*Accident Analysis & Prevention*  
*Asphalt Contractor*  
*Better Roads*  
*CEE Magazine* (UIUC alumni publication)  
*Chicago Tribune*  
*Engineering Structures*  
*FHWA Transportation and Climate Change Newsletter*  
*FHWA The Environmental Quarterly*  
<http://streamstats.usgs.gov/ilstreamstats/>  
*Ingenieria Dictuc*  
*International Journal of Pavement Engineering*  
*International Journal of Road Materials and Pavement Design*  
*International Journal of Transportation Research*  
*Journal of Civil Engineering Materials*  
*Journal of Construction Engineering and Management*  
*Journal of Engineering Mechanics*  
*Journal of Nondestructive Testing & Evaluation*  
*Journal of Solids and Structures*  
*Journal of Testing and Evaluation*  
*Journal of the Association of Asphalt Paving Technologists*  
*Journal of the Mechanics and Physics of Solids*  
*Journal of Transportation Engineering*  
*Rantoul Press*  
*The News-Gazette*  
*Traffic Technology International*  
*Transportation Research Record: Journal of the Transportation Research Board*





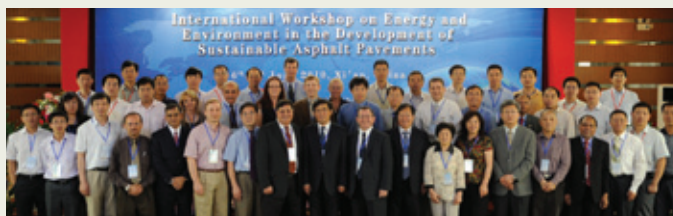
## Research Presented

ICT investigators were invited to present their research at several events and locations throughout the year, including:



Farhad Ansari presents his ICT research on scour sensors at the T.H.E. conference.

- Airfield and Highway Pavements Conference, ASCE
- American Council of Engineering Companies of Illinois / 2009 IDOT Bridge Seminars
- Annual Gulf (Persian) Conference on Roads
- Annual Illinois Traffic Engineering and Safety Conference
- Annual Transportation and Highway Engineering (T.H.E) Conference
- Association of Asphalt Paving Technologists Annual Meeting
- Bradley University, Peoria, Illinois
- Chicago Metropolitan Agency for Planning (CMAP) Transportation Committee Meeting
- Choong-Ang University, Korea
- FAA Worldwide Airport Technology Transfer Conference & Exposition
- First International GSI-Asia Conference
- Fourth EATA Conference
- Geo-Shanghai International Conference 2010
- Great Lakes Geotechnical and Geoenvironmental Conference
- INFORMS Annual Meeting
- International Workshop on Energy and Environment in the Development of Asphalt Pavements
- Korean Institute of Construction Technology (KICT)
- Transport Chicago
- University of Maryland Kirlin Distinguished Seminar Series
- 20 Encontro do Asfalto
- 2009 Precast/Prestressed Convention
- 3rd International Conference on Innovations in Travel Modeling (ITM) of the Transportation Research Board (TRB)
- 7th International Symposium on Non-Destructive Testing in Civil Engineering
- 9th International Conference on Geosynthetics
- 32nd Time Use Conference
- 89th Annual Meeting of the Transportation Research Board



## STAFF SPOTLIGHT:



**Leslie Sweet Myrick** is the ICT editor. She drafts the promotional items for ICT, including the quarterly newsletter and the annual report. She also manages the Web site content, edits all the ICT technical reports, and assists with technology transfer. "One of my biggest accomplishments for the year is what you are reading now, the annual progress report. Although there is obviously a big push for this at the end of the fiscal year, the report really is a compilation of all the research, accomplishments, and activities I have been writing about and promoting all year."

## Conferences and Events Sponsored and/or Exhibited At

An integral part of ICT outreach is its sponsorship of and participation in the following transportation-related conferences.

- Annual Illinois Bituminous Paving Conference
- Annual Illinois Traffic Engineering and Safety Conference
- Annual Transportation and Highway Engineering (T.H.E.) Conference
- CEE Alumni Reception at the Annual Meeting of the Transportation Research Board
- College of Engineering Industry Advisory Board
- Eighth International Conference on the Bearing Capacity of Roads, Railways, and Airfields
- IDOT Career Fair
- Innovations Conference on Asphalt & Transportation (ICAT) 2010

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The ICT exhibit made several appearances throughout the year.



UIUC transportation students help out at the Transportation Research Board reception.

ICT participated in an international sustainability workshop in June 2010.

## ICT congratulates its investigators, staff, and student researchers on the following awards and honors (received during Fiscal Year 09-10):



Imad Al-Qadi (lower left), who was reappointed to the ASCE Board of Governors, meets with the Board, council chairs, and Mary Peters (lower center), who served as U.S. Secretary of Transportation from 2006-2009.

**Imad Al-Qadi** (ICT Director) was elected as a Distinguished Member of the American Society of Civil Engineers (ASCE) for his exemplary leadership and innovation in the civil engineering profession. He was also reappointed to the ASCE Transportation and Development Institute's (T&DI) Board of Governors.



**Leslie Elble** (Assistant to the ICT Director) was presented with the annual Civil and Environmental Engineering Staff Award for Excellence.

Leslie poses with her award plaque.

**Sam Carpenter** (ICT Associate Director and PI for several projects) was recognized as a Distinguished Graduate of the Zachary Department of Civil Engineering at Texas A&M University.

**Barry Dempsey** (UIUC Professor Emeritus and PI for numerous ICHR projects) won the ASCE Horonjeff Award.

**Khaled El-Rayes** (PI for 27-2 and 27-74) has been appointed to a 3-year term as a Specialty Editor of *ASCE Journal of Construction Engineering and Management* in the specialty area of construction time and cost.

**Larry Fahnstock** (Co-PI on ICT 27-70) was awarded the ASCE Reese Prize for his paper titled "Seismic Response and Performance of Buckling-Restrained Braced Frames."

**Jerry Hajjar** (PI on 27-SP12 and Co-PI on 27-70) won the ASCE Shortridge Hardesty Award which recognizes his substantial contribution in applying fundamental problems in the field of structural stability.



Prof. Herrin speaks at the Illinois Bituminous Paving conference.

**Moreland Herrin** (UIUC Professor Emeritus and PI for numerous ICHR projects) was honored for his contributions to the Bituminous Paving conference, including envisioning and implementing the conference 50 years ago.

**James LaFave** (Co-PI on 27-70) was elected a Fellow of the American Concrete Institute (ACI) in recognition of his contributions to the work of the ACI.

**David Lange** (Co-PI for 44) was selected to serve on the American Concrete Institute (ACI) Board of Directors for a 3-year term commencing at the conclusion of the ACI Spring 2010 Convention.

**Liang Liu** (PI for 27-SP14 and Co-PI for 27-2, 27-52, and 27-54) won the ASCE Outstanding Instructor Award.

**Scott Olson** (PI on 27-25 and 27-55; Co-PI on 27-SP12) was presented the 2009 Collins Award for Innovative Teaching from the UIUC College of Engineering. Olson was also promoted to the rank of Associate Professor.

**Yanfeng Ouyang** (PI on 27-20, 27-22, 27-43, 27-34, 27-18, and 27-67; Co-PI on R27-SP4 and R27-13) was a recipient of the 2010 Xerox Award for Faculty Research. He was also elected as the Treasurer of the Railway Applications Section of the Institute for Operations Research and Management Sciences (INFORMS) and the vice chair of the Freight Transportation & Logistics Special Interest Group of INFORMS.

**Jeffrey Roesler** (PI for 57, 27-3, 27-SP11, 27-38, 27-41, 27-61) was a recipient of the 2010 Xerox Award for Faculty Research.

**Marshall Thompson** (PI for 27-12, 27-60, 28-1 and Co-PI for 39-1 and 39-2) was extended honorary membership in Chi Epsilon, the national civil engineering honor society that was founded at the University of Illinois in 1922.

**Erol Tutumluer** (PI for 39-2, 27-1, 27-27, and 27-81) is chair of the ASCE Pavements Committee, which received the Committee of the Year Award from the ASCE Geo-Institute at the Geo-Florida 2010 annual congress.



**Jonguen Baek** (student researcher) completed the requirements for a Ph.D. in transportation engineering from the Department of Civil and Environmental Engineering (CEE) at UIUC. He also won second place in the Federal Aviation Administration (FAA) Design Competition for Universities Airport Operation and Maintenance Design Challenge. **Zhen Leng** (student researcher) received the Mavis Future Faculty Fellows Award for Doctoral Students. He also won second place in the Federal Aviation Administration (FAA) Design Competition for Universities Airport Operation and Maintenance Design Challenge. **Hao Wang** (student researcher) was awarded the Yee Memorial Fund Fellowship for the 2010-2011 academic year.

Jonguen Baek and Zhen Leng display their FAA Design Competition awards.

| PROJECT TITLE                                                                              | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PRINCIPAL INVESTIGATOR(S)*                                                           | RESEARCH TEAM                                                 | TRP CHAIR        | STATUS    |
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| SAFETY ENGINEERING                                                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                      |                                                               |                  |           |
| <b>Speed Photo Enforcement</b>                                                             | R56          | <p>The effects of using speed-radar photo enforcement (SPE) systems on traffic flow characteristics and safety in work zones were evaluated using criteria such as: speed reduction, speed variation/uniformity, speeding violations issued, and other very similar criteria. The effects of SPE on average speed of vehicles and percentage of speeding drivers were compared to the effects of police presence, signs displaying the driver's speed, and combinations of these treatments.</p> <p><b>Outcome: Determined the net effects of using SPE to improve work zone safety.</b></p> | Rahim Benekohal                                                                      | Juan Medina, Ming-Heng Wang, Ali Hajbabaie, & Madhav Chitturi | Priscilla Tobias | Completed |
| <b>Median Cable Scanning Tour</b>                                                          | R27-SP1      | <p>The investigators for this project participated in a scanning tour of Ohio, Oklahoma, and Texas to study these states' use of high-tension cable barriers. After gathering information on system characteristics and performance, the investigators then evaluated alternative high-tension cable barrier systems and products for use in Illinois. The final report identified barrier-based approaches to reduce the number and severity of freeway median crossover crashes in Illinois.</p> <p><b>Outcome: High-tension cable barriers were implemented in Illinois.</b></p>          | Rahim Benekohal                                                                      | Juan Medina                                                   | David Lippert    | Completed |
| <b>Nighttime Construction: Evaluation of Lighting Glare for Highway Construction in IL</b> | R27-2        | <p>This project evaluated lighting glare during nighttime highway construction in Illinois and developed practical tools and objective lighting design criteria for nighttime construction operations.</p> <p><b>Outcome: Provided IDOT with a scientific and objective approach for specifying the required lighting standards in nighttime highway construction projects.</b></p>                                                                                                                                                                                                          | Khaled El-Rayes & Liang Liu with Mostafa Elseifi & Marwa Hassan (Bradley University) | Joe Wakim, Ibrahim Odeh, & Omar El-Anwar                      | Dennis Huckaba   | Completed |
| <b>Texas-AASHTO Retroreflective Sign Sheeting Specifications</b>                           | R27-SP14     | <p>When IDOT was appointed chair of an American Association of State Highway and Transportation Officials (AASHTO) effort to develop a specification that will simplify and improve how sign sheeting materials will be specified for state DOTs, an ICT representative attended a sign sheeting research demonstration in College Station, Texas in May 2009. ICT then provided input into the specifications and documented the demonstration.</p> <p><b>Outcome: Newly proposed sign sheeting specifications for AASHTO and IDOT.</b></p>                                                 | Liang Liu                                                                            |                                                               | Kelly Morse      | Completed |
| <b>Crash Data Analysis &amp; Engineering Solutions for Local Agencies</b>                  | R27-18       | <p>This project evaluated other states' safety service programs for local agencies and developed a plan to establish a successful Illinois program, created a searchable database of local roads crashes, analyzed crash data, developed reports useful to local agencies, and provided crash analysis to local agencies.</p> <p><b>Outcome: Developed tools to allow Illinois local agencies to plan safety based highway improvements.</b></p>                                                                                                                                             | Yanfeng Ouyang with Zongzhi Li (IIT)                                                 | Jang-Hyeon Jo                                                 | Kevin Burke      | Completed |
| <b>Develop Safety Performance Functions for Illinois</b>                                   | R27-20       | <p>Using descriptive and advanced statistical techniques, this study will provide IDOT with analytical tools to identify and manage a program of site-specific and systematic improvements with the end goal of reducing fatalities and severe injuries from motor vehicle crashes. The project deliverables include a prototype software and a user's guide.</p> <p><b>Outcome: Developed SPF models that will be used to screen for candidate locations in Illinois for safety improvements.</b></p>                                                                                       | Yanfeng Ouyang                                                                       | Robert Tegge & Jang-Hyeon Jo                                  | Dave Piper       | Completed |

\* Principal Investigators are UIUC affiliated unless otherwise noted ; general projects will list the ICT Director as PI.



| PROJECT TITLE                                                                  | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | PRINCIPAL INVESTIGATOR(S)*                                | RESEARCH TEAM                                                                     | TRP CHAIR                             | STATUS    |
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| <b>Alternative Intersections - Roundabout Evaluation and Design</b>            | R27-21       | <p>Roundabouts, an alternative intersection design, have been used in several other states, and IDOT is interested in promoting their use at appropriate locations to improve safety. This study identified ten intersections in Illinois that have the potential to reduce fatalities and injuries using a roundabout design, evaluated existing roundabout design software, and obtained feedback from IDOT district and central offices about roundabouts.</p> <p><b>Outcome: Developed design/selection guidelines for roundabouts in Illinois.</b></p>                                                                                                                                                                                                                                                                                                                           | Rahim Benekohal                                           | Varun Atluri                                                                      | Sean Coyle                            | Completed |
| <b>Safety Impacts of Shoulder Attributes in Illinois</b>                       | R27-40       | <p>This study is analyzing the extent to which the presence/absence and width of paved shoulders contribute to vehicle crashes by severity and type; assessing the safety effectiveness of shoulder paving; identifying, mapping, locating, and defining the potential for safety improvements for individual highway segments; and ranking and prioritizing highway segments with high potential for safety improvements for rural two-lane and multilane highways in Illinois in the most cost-effective manner.</p> <p><b>Outcome: Ranking and prioritizing highway segments for shoulder paving and updating current guidelines and practices for IDOT shoulder paving.</b></p>                                                                                                                                                                                                   | Zongzhi Li (IIT)                                          | Ketankumar Patel, Sirisha Bhimireddy, Jonathan Tam, Radhika Bamzai, & Yongdoo Lee | Dave Piper                            | Active    |
| <b>Studying &amp; Minimizing Traffic-Related Work Zone Crashes in Illinois</b> | R27-52       | <p>The objectives of this project include analyzing the frequency and severity of traffic-related work zone crashes in Illinois, conducting a comprehensive analysis to investigate the probable causes and contributing factors of work zone crashes in Illinois, and evaluating the practicality and effectiveness of the Illinois Comprehensive Highway Safety Plan proposed strategy of adding temporary/portable rumble strips within and prior to work zones.</p> <p><b>Outcome: Developing practical recommendations for improved work zone layouts and merge techniques that minimize the probable causes of work zone crashes in Illinois.</b></p>                                                                                                                                                                                                                           | Khaled El-Rayes & Liang Liu                               | Tarek El-Ghamrawy & Ibrahim Odeh                                                  | Marshall Metcalf                      | Active    |
| <b>Effectiveness of Innovative Speed Enforcement Techniques in Illinois</b>    | R27-66       | <p>This study will identify the most effective speed enforcement patrol and saturation patrol procedures and methods, including effective enforcement duration and appropriate staffing level needs in order to more efficiently deploy valuable resources and maximize results. The analyses will result in a better understanding of the impact of the presence/absence and duration of speed enforcement on Illinois highways and how the reduction of speed correlates to the reduction of severe crashes. The findings will allow IDOT and the Illinois State Police to better allocate their resources and ultimately reduce speed-related accidents on Illinois highways.</p> <p><b>Outcome: Developing best practices for patrol and saturation patrol procedures.</b></p>                                                                                                    | Hani Mahmassani, Pei-Wei Lin, & Roger Chen (Northwestern) | Alireza Talebpour                                                                 | Priscilla Tobias & Scott Abbott (ISP) | Active    |
| <b>National Safety Performance Function (SPF) Summit</b>                       | R27-67       | <p>Safety Performance Functions (SPF) are analytical tools developed in a previous ICT project. They are used to identify and manage a system-wide program of site-specific and systematic improvements to develop strategies to prevent and reduce fatalities and severe injuries resulting from motor vehicle crashes. The objective of this project is to convene a national SPF summit to discuss various ongoing and emerging activities and issues regarding the development and implementation of SPFs in order to support system-wide screening for locations with potential for improvements. Such a summit will also assist practitioners with the implementation of the proposed AASHTO Highway Safety Manual Key.</p> <p><b>Outcome: Introduced the concept of SPFs to a wider audience and facilitated the exchange of ideas and best practices related to SPFs.</b></p> | Yanfeng Ouyang                                            | Yun Bai, Xiapeng Li, Mohammad Nourbakhsh, Fan Peng, & Mary Nokes                  | Priscilla Tobias                      | Completed |
| <b>Illinois Highway Safety Manual Workshop</b>                                 | R27-89       | <p>An upcoming workshop will discuss ongoing and emerging activities and issues related to safety performance functions (SPFs) to support system-wide screening for locations with potential for safety or systematic improvements. The attendees will include several state DOTs, IDOT staff, and local agencies.</p> <p><b>Outcome: Facilitating IDOT and other states' increased use of SPFs, which will lead to safety improvements.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                      | To Be Determined                                          |                                                                                   | Priscilla Tobias                      | Active    |

| PROJECT TITLE                                                                                        | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PRINCIPAL INVESTIGATOR(S)*                                          | RESEARCH TEAM                                     | TRP CHAIR       | STATUS    |
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| <b>Investigation of Contributing Factors RE: Wrong-Way Driving on Freeways</b>                       | R27-90       | The objective of this project is to identify trends with wrong-way crashes (geometric designs, certain locations, age groups, etc.) and then to identify systematic and policy changes that will address the trends identified.<br><br><b>Outcome: Determining contributing factors to wrong way driving on freeways and ways to reduce these errors and related crashes.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Huaguo Zhou, Ryan Fries, Brent Vaughn, & Chiang Lin (SIUE)          |                                                   | Dave Piper      | Active    |
| <b>Evaluation of Flashing Yellow Arrows (FYA) for Protected/ Permissive Left Turn (PPLT) Control</b> | R27-97       | This research will evaluate the effectiveness of flashing yellow arrows (FYA) at protected/permissive left turn signals in terms of safety and operations. The information gained will help IDOT quantify the safety and operational benefits of upgrading to FYA displays.<br><br><b>Outcome: Improving intersection safety for Illinois motorists.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | To Be Determined by RFP Process                                     |                                                   | Randall Laninga | New       |
| <b>STRUCTURES/ HYDRAULICS/ GEOTECHNICAL</b>                                                          |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                     |                                                   |                 |           |
| <b>Precast Deck Beam Lifting Loops</b>                                                               | R54          | To address a lack of published guidance on the design of lifting loops for shallow members, this study reviewed current practices and tested a range of lifting loop arrangements.<br><br><b>Outcome: Developed a standard for the fabrication, embedment, anchorage, and use of lifting loops in precast deck beams, with an emphasis on shallow precast members that are 11 and 17 inches deep.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                | Daniel Kuchma & Christopher Hart                                    | Jason Motsinger & Bryan Fehrenbacher              | Kevin Riechers  | Completed |
| <b>Chicago Bridge Deck &amp; Bridge Piers</b>                                                        | R27-SP2      | This project, which required a quick turnaround, evaluated damaged bridge columns at two locations in the City of Chicago. After a highway bridge girder suddenly collapsed on the Chicago Kingery Expressway, the columns were evaluated for internal structural damage and the reinforcement steel condition was identified. For the Dan Ryan Expressway (I-90/94) bridge decks, a non-destructive evaluation was conducted using ground penetrating radar to measure the reinforcement cover depth.<br><br><b>Outcome: Rapid response saved additional testing and repair costs and reduced construction delays and costly construction downtime. Timely and accurate measurements of the Dan Ryan Expressway bridge resulted in IDOT changing its rehabilitation technique, which saved millions of dollars in repair costs.</b> | Imad Al-Qadi & John Popovics                                        | Wie Xie & Gonzolo Centrangolo                     | David Lippert   | Completed |
| <b>Non-Destructive Evaluation of Reinforced Concrete Structure</b>                                   | R27-SP7      | As part of this project, low-volume, older bridges in Illinois were evaluated to ensure their structural integrity. Because most of the damage to these bridges is likely to be near the bottom or internal, the bridges were evaluated using innovative nondestructive testing technology.<br><br><b>Outcome: Developed procedure for evaluating older bridges in Illinois with non-destructive technology.</b>                                                                                                                                                                                                                                                                                                                                                                                                                     | Imad Al-Qadi & John Popovics                                        | Sara Alzate Diaz                                  | David Lippert   | Completed |
| <b>DeKalb County Bridge Collapse Investigation</b>                                                   | R27-SP12     | This project consisted of a forensic investigation of the collapse of Bridge No. SN 019-5010 in DeKalb County, Illinois on August 19, 2008. Comprehensive experimental and analytical studies were conducted to determine the primary cause of failure.<br><br><b>Outcome: Determined that structural overload, leading to fracturing of the timber piles in combined compression and flexure, was the likely reason for the bridge failure.</b>                                                                                                                                                                                                                                                                                                                                                                                     | Bassem Andrawes, Jerome Hajjar, & Scott Olson                       | Daniel Borello, James Hansen, & Jason Buenker     | Jim Klein       | Completed |
| <b>Illinois StreamStats</b>                                                                          | R27-6        | This project developed and serviced Illinois-StreamStats, an automated Internet Map Server (IMS) which produces discharge determinations at rural sites. Illinois-StreamStats is interfaced with the National Flood Frequency program to generate peak flood discharges at various frequencies. The web-based program is easily accessible and offers consistent and reliable solutions to the equations and methodology contained within the 2004 United States Geological Survey (USGS) report.<br><br><b>Outcome: Developed web program that reduced the time and resources, and consequently costs, required to size bridge and culvert waterway openings and to prepare other water resources studies.</b>                                                                                                                      | David Soong, Audrey Ishii, & Jennifer Sharpe (US Geological Survey) | Alisa Halm, King Shan Kwok, & Christopher Hamblen | Matt O'Connor   | Completed |

| PROJECT TITLE                                                                   | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | PRINCIPAL INVESTIGATOR(S)*            | RESEARCH TEAM                  | TRP CHAIR         | STATUS    |
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| I-39 Kishwaukee Bridge Monitoring                                               | R27-9        | <p>A distributed intelligent bridge monitoring system was developed for the Kishwaukee Bridge to provide continuous health information. The long-term monitoring effort has yielded a variety of data which spans several years, including measurements such as bridge deck acceleration, temperature changes, crack opening displacement data from local deformation gages, modal frequencies, shear strain at known crack locations, and daily truck traffic.</p> <p><b>Outcome: Determined possible structural changes and guided retrofit strategies for compromised bridge components, ensuring the bridge's integrity and stability into the future.</b></p>                                                                                                       | Ming Wang (UIC)                       | Jinsuk Yim                     | Todd Ahrens       | Completed |
| Pier Scour Prediction in Cohesive Soils: Use of EFA-SRICOS Method in IL         | R27-19       | <p>To assess scour in cohesive sediments, a new methodology, The Scour Rate in Cohesive Soils-Erosion Function Apparatus (SRICOS-EFA) has been developed and is being evaluated along with the current methodology used in Illinois for non-cohesive sediments (primarily sand), HEC-18. The SRICOS-EFA method is being tested for estimating scour depth of cohesive soils to potentially validate its use for Illinois streams. The project will then compare the SRICOS-EFA method to the HEC-18 scour estimates.</p> <p><b>Outcome: Validated and calibrated scour assessment methodology for Illinois streams.</b></p>                                                                                                                                              | Timothy Straub (US Geological Survey) | Michael Drog & Joseph Parker   | Matt O'Connor     | Completed |
| Evaluation/ Modification of IDOT Foundation Piling Design & Construction Policy | R27-24       | <p>The objective of this study was to assess IDOT's and other methods for estimating pile capacity, to improve IDOT's methods if possible, and to determine resistance factors appropriate for the methods. This study reports pile load test data along with pile driving information and subsurface information, and uses this information to investigate and quantify the accuracy and precision with which five different static methods and five different dynamic formulae predict capacity. Three databases were assembled and used to quantify the ability of these methods to predict capacity.</p> <p><b>Outcome: Developed an improved method for estimating pile length and capacity.</b></p>                                                                | James Long                            | Josh Hendrix & Alma Baratta    | William Kramer    | Completed |
| Modification of IDOT Integral Abutment Design Limitations & Details             | R27-25       | <p>Because the current guidelines and limitations that apply to integral abutment bridges (IABs) have several gaps and grey areas, IDOT requested further investigation. The objective of this project is to develop and document rational guidelines and limitations for IABs as well as construction and monitoring plans for instrumenting existing and/or planned IABs. A more rational design approach will allow pile and soil modifications to meet the demands of an IAB for conditions in which they currently may not be considered.</p> <p><b>Outcome: Developing a new design approach for IABs in Illinois.</b></p>                                                                                                                                         | Scott Olson & James Long              | James Hanson & Dzuigas Renekis | William Kramer    | Completed |
| Free-Cutting Brass Breakaway Couplings                                          | R27-26       | <p>The objective of this project is to evaluate the design of a free-cutting brass breakaway coupling device for use in supporting light poles. Free-cutting brass breakaway coupling devices could be used to replace the currently used aluminum or steel couplings and potentially save IDOT significant resources. The evaluation will consist of a finite element analysis of brass couplings to predict distribution of stresses and experimental testing of single and four-couplings assemblies to evaluate energy absorbing capacity.</p> <p><b>Outcome: Quantifying the energy absorbing capacity of different shapes of single, and multiple brass couplings and developing a prototype shape for brass couplings to use in full-scale crash testing.</b></p> | Daniel Kuchma                         | Sang-Ho Kim & Heui Hwang Lee   | Christopher Hahin | Active    |
| Simple Cost Effective Scour Sensor                                              | R27-35       | <p>The objective of this project was to develop a simple sensor for detection of scour depth under the bridge piers and abutments. The sensor principle is based on optical fiber transduction of scour. The research involved development, testing, and fabrication of the prototype sensor assembly, laboratory prototype testing, modeling, fabrication of field sensor, and field implementation.</p> <p><b>Outcome: Developed a fiber optic scour sensor capable of monitoring and providing quantitative characteristics of both scour depth and flow processes, i.e. rate that will allow for better monitoring of scour and therefore better bridge maintenance.</b></p>                                                                                         | Farhad Ansari (UIC)                   | Amirhossein Iranmanesh         | Dave Copenbarger  | Completed |



| PROJECT TITLE                                                                                    | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PRINCIPAL INVESTIGATOR(S)*                                    | RESEARCH TEAM                                          | TRP CHAIR         | STATUS    |
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| Transfer/ Development Length of Prestressing Tendons in AASHTO I-Girders Using S-C Concrete      | R27-36       | <p>The increasing interest among Illinois precasters in using self-consolidated concrete (SCC) in bridge girders motivated this synthesis study, which reviewed and combined information from literature discussing the impact of using SCC on the transfer and development lengths of prestressing tendons in AASHTO bridge girders. The study utilized the results of previous research to evaluate the effect of using SCC on the transfer and development lengths of prestressing tendons, evaluate how SCC compares with conventional concrete, and investigate the feasibility of using SCC in AASHTO bridge girders without the need for changing current design provisions recommended by the ACI and AASHTO.</p> <p><b>Outcome: Provided IDOT with recommendations regarding the application of SCC in prestressed bridge girders.</b></p> | Bassem Andrawes                                               | Moochul Shin                                           | Thomas Domagalski | Completed |
| Instrumentation & Monitoring of "Extreme" Integral Abutment Bridges in Illinois                  | R27-55       | <p>This project builds on a previous ICT project to improve the economy and applicability of integral abutment bridges (IABs) in Illinois. The researchers will select, instrument, and monitor one or more IABs to verify current design assumptions, validate the numerical analyses from the previous project, measure actual soil/foundation/abutment performance, and monitor the long-term behavior of these systems.</p> <p><b>Outcome: Revised Bridge Manual to expand the use of integral abutment bridges, improve design methods and construction procedures, and verify performance of these structures in Illinois.</b></p>                                                                                                                                                                                                            | Scott Olson & James Long                                      | Jason Buenker                                          | William Kramer    | Active    |
| Transfer & Development Lengths in Prestressed Self-Consolidating Concrete Bridge Box & I-Girders | R27-56       | <p>This research will assess and experimentally evaluate the effect of using self-consolidating concrete (SCC) on the transfer and development lengths of prestressing tendons in prestressed box and I-girders which are commonly used in Illinois bridges and compare it with the ACI and AASHTO code requirements.</p> <p><b>Outcome: Completing essential step towards adopting the technology of SCC in the state of Illinois.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                         | Bassem Andrawes                                               | Andrew Pozolo                                          | Thomas Domagalski | Active    |
| Superiority & Constructability of Fibrous Additives for Bridge Deck Overlays                     | R27-57       | <p>This study will evaluate the advantages fibrous additives can add to the performance of bridge deck concrete overlays, which can in turn lead to substantial life-cycle cost savings, an aesthetic product, good riding quality, and enhancement in the overall structural behavior and performance of bridges.</p> <p><b>Outcome: Documenting recommendations and guidelines on the design and construction of high performance, durable, and crack resistant overlay mixtures with fibrous additives.</b></p>                                                                                                                                                                                                                                                                                                                                  | Mohammad Alhas-san & Suleiman Ashur (Purdue)                  | James Welch, Nicholas Fenton, Steve Aime, & Brad Smith | Gary Kowalski     | Active    |
| Improved Design for Driven Piles Based on a Pile Load Test Program in Illinois                   | R27-69       | <p>This project initiates pile testing to improve pile foundation designs. The Pile Driving Analyzer (PDA), CAPWAP program, and static load testing will be used to increase the maximum nominal required bearing designers can specify to reduce the number and/or weight of piles; decrease the difference between estimated and driving pile lengths to reduce cutoffs and splice lengths by development of local bias factors; increase reliance on pile setup to increase the factored resistance available to designers; reduce risk of pile driving damage during construction; and increase resistance factor (decrease factor of safety) based on increased data and confidence from load tests in and near Illinois.</p> <p><b>Outcome: Developing more efficient, cost-effective pile foundation designs.</b></p>                        | James Long                                                    | Andrew Anderson & Dave Hall                            | William Kramer    | Active    |
| Calibration & Refinement of Illinois' Earthquake Resisting System Bridge Design Methodology      | R27-70       | <p>This project will use both experimental and computational research to investigate, validate, calibrate, and adjust (if necessary) high-priority components of the current Illinois Earthquake Resisting System strategy. The work will focus on the specific seismic hazard and structural characteristics appropriate for Illinois. A new strategy will lead to a more rational and consistent bridge design approach that can best balance necessary structural safety with design methodologies, construction practices, and construction costs appropriate for the state of Illinois.</p> <p><b>Outcome: Developing refined seismic design criteria specific to the needs of Illinois.</b></p>                                                                                                                                               | James LaFave, Jerome Hajjar, Larry Fahnestock, & Doug Fautsch | Joshua Steelman & Evgueni Filipor                      | Daniel Tobias     | Active    |

| PROJECT TITLE                                                                         | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | PRINCIPAL INVESTIGATOR(S)*                                           | RESEARCH TEAM                          | TRP CHAIR               | STATUS |
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| Field Implementation and Evaluation of the Simple Cost-Effective Scour Sensor         | R27-71       | <p>The objective of this project is to implement and evaluate a scour sensor that was developed in a previous ICT project. The investigators will perform comprehensive field testing on a multi-span bridge with several piers and will examine various design parameters in terms of sensor dimensions, scour depths, resolution, and numerical calibration schemes. The optimum sensor parameters will be selected based on these parameters. The research will focus on installation of several sensors at different pier locations and interface software for simultaneous detection of scour.</p> <p><b>Outcome: Developing design and installation details and performing field implementation and instrumentation for the scour sensor.</b></p> | Fahrad Ansari (UIC)                                                  | Ali Zarafshan & Amirhossein Iranmanesh | Dave Copenbarger        | Active |
| Fatigue Testing of Brass Break-away Couplings                                         | R27-80       | <p>This project will determine the fracture characteristics of the free-cutting brass breakaway couplings in either a pendulum or full-scale crash test at an FHWA-certified crash test facility in order to place these couplings in actual service and to evaluate their fatigue life under stress.</p> <p><b>Outcome: Potential cost savings due to use of and new source for brass breakaway couplings.</b></p>                                                                                                                                                                                                                                                                                                                                     | Grzegorz Banas & Fred Lawrence                                       | Joseph Rudd                            | Chris Hahin             | Active |
| Strengthening of Bridge Wood Pilings Retrofits for Moment Resistance                  | R27-82       | <p>The primary objective of this research is to develop enhanced repair / retrofitting techniques for bridges supported on wood pilings through the application of fiber reinforced polymer (FRP) composites and other suitable materials.</p> <p><b>Outcome: Savings in the significant costs associated with chemically treating or replacing deteriorated bridge wood piles; increasing the longevity of wood piling bridges which would reduce the demand for new bridge construction; increasing the public safety, and avoiding future bridge catastrophic failures.</b></p>                                                                                                                                                                      | Bassem Andrawes                                                      | Jay Bose                               | Dan Tobias              | Active |
| Bridge Decks: Mitigation of Cracking & Increased Durability                           | R27-88       | <p>This project includes testing and analytical research to refocus Illinois' efforts to build bridge decks that exhibit less cracking over time in conjunction with increased durability.</p> <p><b>Outcome: Developing a systematic technique for re-implimenting high-performance concrete into Illinois' bridge decks.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                      | Paramita Mondal & Doug Foutch with Riyadh Hindi (Bradley University) |                                        | Dan Tobias              | Active |
| Evaluation of Concrete Cylinder Match Curing & Evaluation of 4"x8" Cylinders          | R27-98       | <p>This research will determine if match curing that uses a mold or a chamber is acceptable, the required specifications, and an accurate measure of strength at various ages for precast prestressed products. The research will evaluate the use of 4"x8" concrete test cylinders as a substitute for the standard 6"x12" cylinders and will determine if a correlation between a 4"x8" and 6"x12" cylinder is needed.</p> <p><b>Outcome: Establishing performance standards for match curing of concrete test cylinders to reduce production time and costs.</b></p>                                                                                                                                                                                 | John Popovics                                                        |                                        | Doug Dirks & Dan Tobias | New    |
| Improvement for Determining the Axial Capacity of Drilled Shafts in Shale in Illinois | R27-99       | <p>This research will identify, quantify, and implement methods to better design drilled shaft foundations in shale in Illinois.</p> <p><b>Outcome: More efficient design and decreased cost for drilled shafts found in shale.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | James Long                                                           |                                        | William Kramer          | New    |

| PROJECT TITLE                                                                                     | PROJECT CODE     | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PRINCIPAL INVESTIGATOR(S)*                                          | RESEARCH TEAM                               | TRP CHAIR                        | STATUS    |
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| <b>CONSTRUCTION</b>                                                                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                     |                                             |                                  |           |
| <b>Evaluation of 3-D Laser Scanning for Construction Applications</b>                             | R27-30           | <p>This project is researching the feasibility of using laser technology to monitor IDOT highway construction activities and transportation structures. Data obtained using laser scanning technology is being compared to data obtained using traditional methods.</p> <p><b>Outcome: Validated a cost-effective and accurate laser technology, which can impact the efficiency and cost control of future construction projects.</b></p>                                                                                                                                                                                                                                                                                | Dianne Slattery & Kerry Slattery (SIUE)                             | Brandon Egelhoff, Joe Vickey, & Brian Schuh | Ted Nemsky                       | Completed |
| <b>Documentation of Contract Quantities Training</b>                                              | R27-49           | <p>Beginning in 2009, the ICT took over the administration of the Documentation of Contract Quantities class. Documentation certification is required for all consultants to become prequalified with IDOT to perform construction inspection (Phase III) work. Students in this class learn to document contract quantities in compliance with state and federal standards. The class covers project diary entries, quantity book preparation, the cross-reference system, extra work reports, and the measurement and calculation of pay items for pay quantities occurring in road and bridge plans.</p> <p><b>Outcome: Well-trained, prequalified consultants to perform construction inspection in Illinois.</b></p> | Imad Al-Qadi                                                        | Mary Fries                                  | Mike Renner                      | Active    |
| <b>An Expert Systems Approach to Highway Construction Scheduling</b>                              | R27-86           | <p>This project will develop a software product that leads engineers through the schedule logic design process by means of a graphical user interface that "visualizes" construction operations as they progress over time.</p> <p><b>Outcome: Improving the accuracy of the engineer's estimate of contract time required for highway construction projects.</b></p>                                                                                                                                                                                                                                                                                                                                                     | Dianne Slattery, Kerry Slattery, and Richard Bruce (Missouri State) |                                             | Mike Ripka                       | Active    |
| <b>PAVEMENT DESIGN &amp; MANAGEMENT/ MATERIALS</b>                                                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                     |                                             |                                  |           |
| <b>Mechanistic-Empirical (M-E) Design, Implementation &amp; Monitoring for Flexible Pavements</b> | R28-1/<br>R27-60 | <p>This project provides technical support to IDOT concerning the mechanistic-empirical (M-E) design, implementation, and monitoring of flexible pavements. Although UIUC researchers developed M-E-based flexible pavement design concepts and procedures for IDOT in previous projects (IHR-510 and IHR-527), which have been implemented, IDOT continues to support a variety of M-E design, implementation, and monitoring activities.</p> <p><b>Outcome: Developing improved M-E flexible pavement design procedures for the IDOT Bureau of Design and Environment and the Bureau of Local Roads &amp; Streets.</b></p>                                                                                              | Marshall Thompson & Imad Al-Qadi                                    |                                             | David Lippert & Charles Wienrank | Active    |
| <b>Binder/ Mixture Testing and Analysis</b>                                                       | R28-2            | <p>As mechanistic designs rely more on dynamic modulus predictions, the generation of rheological binder data (G*) and rheological mixture data (E*) becomes more crucial. This project provided support for data reduction, interpretation, and included limited testing. Dynamic Shear Rheometer data for IDOT binders was analyzed to develop indications of the expected dynamic modulus, E*.</p> <p><b>Outcome: Developed a method to support rheological mixture selections for different binder grades.</b></p>                                                                                                                                                                                                    | Samuel Carpenter                                                    |                                             | Amy Schutzbach                   | Completed |
| <b>Validation of Extended Life HMA Pavement Design</b>                                            | R39-1            | <p>This research provided test data for dynamic modulus and fatigue for 21 current IDOT mixes in accordance with the AASHTO 2002 data requirements for pavement design. The fatigue testing validated fatigue algorithms and illustrated the existence and magnitude of a fatigue endurance limit. Full Depth HMA sections were constructed, instrumented, and response tested with the falling weight deflectometer and the ATLAS. Nine binder mixes were tested for rich bottom binder fatigue characterization.</p> <p><b>Outcome: Validated material behavior for an improved design procedure for extended life HMA pavements.</b></p>                                                                               | Samuel Carpenter & Marshall Thompson                                | Shannon Beranek & Chris Dunbar              | Amy Schutzbach                   | Completed |



| PROJECT TITLE                                                                                    | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PRINCIPAL INVESTIGATOR(S)*         | RESEARCH TEAM                   | TRP CHAIR         | STATUS    |
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| <b>Nondestructive Pavement Evaluation Using ILLI-PAVE Based Artificial Neural Network Models</b> | R39-2        | <p>The objective of this project was to develop advanced pavement structural analysis models for more accurate solutions with fast computation schemes. Soft computing and modeling approaches, specifically the Artificial Neural Network (ANN) and Genetic Algorithm (GA) techniques, were implemented to develop forward and backcalculation type pavement analysis models based on the validated nonlinear ILLI-PAVE finite element solutions of the most commonly found/constructed flexible pavements in the state of Illinois.</p> <p><b>Outcome:</b> Created a pavement evaluation toolbox that can be used for rapidly and more accurately backcalculating field or in-service pavement layer properties and thicknesses; predicting critical stress, strain, and deformation responses of these in-service pavements in real time from the measured falling weight deflectometer deflection data; and incorporating predicted pavement responses directly into IDOT's mechanistic pavement analysis and design.</p> | Erol Tutumluer & Marshall Thompson | Onur Pekcan                     | Charles Wienrank  | Completed |
| <b>Self-Consolidating Concrete</b>                                                               | R44          | <p>The objective of this project was to better understand how self-consolidating concrete (SCC) performs in fresh and hardened states and to provide protocols and criteria for specifications and test procedures for SCC mixtures and construction practices. The investigators based their investigation on the extensive reconstruction of I-74 through Peoria, IL, which used SCC for over 20 miles of retaining wall structures.</p> <p><b>Outcome:</b> Developed six new test methods for measurement of SCC performance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | David Lange & Leslie Struble       |                                 | James Krstulovich | Completed |
| <b>Concrete Distress Identification</b>                                                          | R53          | <p>This project included two distinct studies related to concrete distress. The first identified the cause of distress observed in relatively new pavement in Valmeyer, IL, and the second was to assess the alkali-silica reactivity (ASR) of chert.</p> <p><b>Outcome:</b> Provided valuable input for pavement design and maintenance procedures due to a better understanding of ASR deterioration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Leslie Struble                     |                                 | Brian Pfeifer     | Completed |
| <b>Evaluation / Optimization of Tack &amp; Bond of HMA Overlays of PCC</b>                       | R55          | <p>This study included three major components to quantify the outcome of various parameters on the permanent deformation of HMA overlay: laboratory testing, numerical modeling, and accelerated pavement testing. The lab testing evaluated HMA material type, tack coat type, tack coat application rate, PCC surface texture, temperature, and moisture conditions. The field work consisted of creating 25 test sections of HMA overlays poured on PCC with varied HMA types, tack coat types, tack coat application rates, and PCC surface textures. The test sections were then loaded with ATLAS. The results validated laboratory determined optimum tack coat application rate, which provided the lowest interface strain and surface rutting in the field.</p> <p><b>Outcome:</b> Validated specific tack coat application rates that are in IDOT standard specifications.</p>                                                                                                                                     | Imad Al-Qadi & Samuel Carpenter    | Zhen Leng & Hasan Ozer          | Jim Trepanier     | Completed |
| <b>Evaluation &amp; Implementation of Improved CRCP &amp; JPCP Design</b>                        | R57          | <p>This study refined IDOT's jointed plain concrete pavement (JPCP) design and developed a continuously reinforced concrete pavement (CRCP) design process based on M-E principles and recent findings, including the release of the new M-EPDG. The new developments in the proposed design process include fatigue damage accumulations at the critical top and bottom location in the CRCP slab, equations for calculating the equivalent damage ratio for several shoulder types and crack stiffness values, application of a strength reduction factor to the concrete stress ratio calculated at the surface of the CRCP, and a new logistic-type punchout prediction model.</p> <p><b>Outcome:</b> Developed input for two IDOT design guides: 1) mechanistic-empirical continuously reinforced concrete pavement and 2) jointed plain concrete pavement.</p>                                                                                                                                                          | Jeffery Roesler                    | Matthew Beyer & Amanda Bordelon | Amy Schutzbach    | Completed |

| PROJECT TITLE                                                                                | PROJECT CODE            | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PRINCIPAL INVESTIGATOR(S)*                    | RESEARCH TEAM               | TRP CHAIR                      | STATUS    |
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| <b>Cost-Effectiveness &amp; Performance of Overlay Systems / Crack Control Methods in IL</b> | R58                     | <p>This project used theoretical approaches, laboratory experiments, and field evaluations to evaluate different rehabilitation methodologies and gain a better understanding of crack initiation, propagation, and control mechanisms. Cracks were quantified in the field by using image analysis and ground penetrating radar (GPR) surveys. The researchers also conducted advanced laboratory material characterization and developed finite element models to simulate crack initiation and propagation as well as to simulate various interlayer systems. The cost-effectiveness of interlayer systems through life-cycle cost analysis (LCCA) was also investigated.</p> <p><b>Outcome: Introduced a method to better identify reflective cracking in the field using digital imaging and GPR signal analysis and developed a decision-making procedure for selecting a cost-effective interlayer system in the state of Illinois when HMA overlay is used for pavement rehabilitation.</b></p>                                                                                                                                                                   | William Buttlar & Imad Al-Qadi                | Jongeeun Baek & Minkyum Kim | Joe Vespa                      | Completed |
| <b>Evaluation of Pavement Damage Due to New Tire Designs</b>                                 | R59                     | <p>This project quantified pavement responses due to various tire designs, including the wide-base tire, through advanced modeling and accelerated pavement testing. Wide base tires have the potential to provide numerous benefits to the trucking industry, including increased fuel efficiency and hauling capacity and lessened gas emission and cost. However, a source of concern has been that they may cause increased damage to highway pavements. This research showed that wide-base tires actually have similar total pavement impact on the interstate highway pavements as the dual-tire system; although the pattern of damage could be different. By addressing potential concerns, this research demonstrated that wide-base tires have the potential to benefit the nation's trucking industry and the environment.</p> <p><b>Outcome: Improved asphalt thickness selection by characterizing pavement response due to different tire designs and a quantification of expected savings from wide-base tires, through hauling more goods and lowering the impact on the environment, showing expected savings to be in the billions of dollars.</b></p> | Imad Al-Qadi                                  | Hao Wang                    | Mark Gawedzinski               | Completed |
| <b>Profile Equipment Verification (PEV) - FY06 - FY09</b>                                    | R27-SP3, SP5, SP9, SP13 | <p>This program certified that contractors' profilograph machines, which measure the smoothness of pavements, met IDOT standards. Clean, marked test lanes with an initial baseline profile for comparison were set up as a test track at the Rantoul Airport. Then, contractors' machines were tested on the track, and the results were forwarded to IDOT. All contractors wanting to work with the state needed to have their machine tested on this track.</p> <p><b>Outcome: Implemented a program to guarantee the accuracy of pavement smoothness ratings for state of Illinois work.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Imad Al-Qadi, Samer Dessouky, & James Meister |                             | David Lippert & LaDonna Rowden | Completed |
| <b>2008 RILEM Conference on Cracking in Pavements</b>                                        | R27-SP6                 | <p>The ICT planned and served as the major sponsor for the Sixth RILEM International Conference on Cracking in Pavements on June 15-19, 2008, in Chicago, Illinois. The conference drew nearly 200 attendees from 29 countries and included the presentation of 89 papers from more than 20 countries.</p> <p><b>Outcome: Facilitated the development and discussion of ground-breaking research regarding pavement cracking and introduced the ICT to the international pavement community.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Imad Al-Qadi                                  |                             | David Lippert                  | Completed |
| <b>Analysis of I-57 Recycled CRCP Cores</b>                                                  | R27-SP11                | <p>Cores that were extracted from the Continuous Reinforced Concrete Pavement (CRCP) inlay by IDOT were analyzed for the presence of deleterious alkali-silica reactivity (ASR) to make an accurate assessment of the performance of this recycled concrete pavement.</p> <p><b>Outcome: Independent analysis helped IDOT determine if there was deleterious ASR or an inadequate air void system in the recycled concrete experimental CRCP section on I-57.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Jeffery Roesler                               | Greg Huntley                | Mark Gawedzinski               | Completed |
| <b>Evaluation of Horizontal Directional Drilling (HDD)</b>                                   | R27-SP16                | <p>This project studies the effects of horizontal directional drilling (HDD) for utilities under pavement to aid the state of Illinois in writing policies and procedures for administering HDD permit requests.</p> <p><b>Outcome: Documenting recommendations for HDD that consider the overall safety, aesthetic quality, costs, and difficulty of construction and maintenance of both utilities and roadways.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Youssef Hashash                               |                             | Terri Petersen                 | Active    |

| PROJECT TITLE                                                                  | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | PRINCIPAL INVESTIGATOR(S)*                                                | RESEARCH TEAM                                             | TRP CHAIR         | STATUS    |
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| Warm Mix Asphalt Study                                                         | R27-SP17     | The objective of this project is to evaluate the performance characteristics of asphalt mixtures produced with new technologies and materials and provide a method of comparison between the mixtures.<br><br><b>Outcome: Providing IDOT with decision tools to implement warm mix asphalt mixtures, recycled asphalt shingles, and alternative friction aggregates.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Imad Al-Qadi, Jeff Kern, & Jim Meister                                    |                                                           | Tom Zehr          | Active    |
| Characterization of IL Aggregates for Subgrade Replacement and Subbase         | R27-1        | This project examines the characteristics of Illinois aggregates to determine relationships between different aggregate properties and IBR/ IBV and the sensitivity of the aggregate IBR/IBV to changes in moisture content. The strength, stiffness, and deformation behavior of various types and qualities of aggregate commonly used in Illinois will be characterized for an improved prediction of cover thickness requirements and field performances. The findings, which could reduce treatment thickness and help avoid aggregate failures, will be incorporated into the Subgrade Stability Manual to allow consideration of aggregate characteristics when determining thickness.<br><br><b>Outcome: Recommended revisions to IDOT's Subgrade Stability Manual and Specifications will reduce expenditures for aggregate in subgrade applications.</b> | Erol Tutumluer with Abbas Butt (ERI)                                      | Debakanta Mishra                                          | Riyad Wahab       | Completed |
| Design & Concrete Material Requirements for Ultra-Thin Whitetopping Procedures | R27-3        | Ultra-thin whitetopping (UTW) is a pavement rehabilitation strategy where a thin layer of concrete is placed on top of an existing hot-mix asphalt pavement. This research provided IDOT with a UTW thickness design method and guidelines for UTW design, concrete material selection, and construction practices.<br><br><b>Outcome: Developed structural design and construction guidelines for UTW and appropriate concrete material requirements to achieve a design of the intended service life and disseminated these guidelines to local agencies.</b>                                                                                                                                                                                                                                                                                                    | Jeffery Roesler with Anastasios Ioannides (University of Cincinnati)      | Amanda Bordelon, Matthew Beyer, & Dong Wang               | James Krstulovich | Completed |
| Hot Mix Asphalt (HMA) Sampling                                                 | R27-8        | This project promoted an understanding of successful methods and practices currently used to sample HMA during production and placement. During the project, sufficient data was collected to allow IDOT's personnel to recommend the optimum technique for HMA sampling in future projects.<br><br><b>Outcome: Improved Quality Control/Quality Assurance regulations for Illinois HMA sampling.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Mostafa Elseifi (Bradley University)                                      |                                                           | Jim Trepanier     | Completed |
| Determination of Usable Residual Asphalt Binder in RAP                         | R27-11       | Illinois has been using reclaimed asphalt pavements (RAP) in hot-mix asphalt (HMA) pavements since 1980, but the optimal design of these pavements has continually been questioned. Therefore, this project investigated the use of RAP with up to 50% of the total original material. The research focused on understanding the interaction between the new and recycled asphalt components using state-of-the-art technologies, including scanning electron microscopy, to quantify the effectiveness of using RAP in HMA.<br><br><b>Outcome: Developed a scientifically proven approach to optimize the use of RAP in new pavements.</b>                                                                                                                                                                                                                        | Imad Al-Qadi & Samuel Carpenter with Mostafa Elseifi (Bradley University) | Geoff Roberts, Hasan Ozer, Qazi Aurangzeb, & Greg Huntley | Jim Trepanier     | Completed |
| Cold In-Place & Full Depth Recycling with Asphalt Products (CI & FDRwAP)       | R27-12       | This research evaluated and contributed to the facilitation and implementation of currently available Cold-In-Place Recycling and Full Depth Recycling with Asphalt Products (CIR&FDRwAP) technology. An "information/data" survey was conducted; ten selected CIR&FDRwAP projects were documented and evaluated; mixture properties (modulus, strength, fatigue) were established; thickness design options were evaluated; mixture design approaches were evaluated; and construction aspects were considered.<br><br><b>Outcome: Developed guidelines for CIR&amp;FDRwAP and recommended it as a standard procedure instead of an "experimental feature."</b>                                                                                                                                                                                                   | Marshall Thompson & Samuel Carpenter                                      | Luis Garcia                                               | Kevin Burke       | Completed |



| PROJECT TITLE                                                                                                | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PRINCIPAL INVESTIGATOR(S)*      | RESEARCH TEAM                                 | TRP CHAIR        | STATUS    |
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| <b>Expansive Characteristics of Recycled Materials Used as Pavement Base Materials</b>                       | R27-27       | Current IDOT specifications do not allow the use of reclaimed asphalt pavement (RAP) in the pavement substructure layers. The implications of this exclusion are being studied by first identifying the expansive nature of RAP sources statewide and secondly by establishing guidelines for blending recycled and virgin aggregates for the pavement substructure use. The effects that RAP materials may have on pavement performance will also be researched.<br><br><b>Outcome: Developed a test method for the expansion of RAP aggregate and determined the maximum acceptable level of expansion for different RAP aggregate types, properties, and blending proportions with virgin aggregates.</b>                                                                  | Erol Tutumluer & John Popovics  | Derya Deniz                                   | Sheila Beshears  | Completed |
| <b>8<sup>th</sup> International Conference on Bearing Capacity of Roads, Railways &amp; Airfields (2009)</b> | R27-28       | The ICT sponsored the Eighth International Bearing Capacity of Roads, Railways & Airfields (BCR2A) Conference on the UIUC campus. The main objective of the BCR2A Conference was to promote efficient design, construction, and maintenance of the transportation infrastructure by addressing issues related to the bearing capacity of roads, railways, and airfields.                                                                                                                                                                                                                                                                                                                                                                                                      | Erol Tutumluer                  |                                               | David Lippert    | Completed |
| <b>Impact of High RAP Content on Pavement Structural Performance</b>                                         | R27-37       | Agencies in Illinois are attempting to use up to 50% recycled or reclaimed asphalt pavement (RAP) in HMA to realize economic savings. However, the structural behavior and durability differences resulting from such a recycling operation have not been addressed. This project will examine the effect of high RAP contents on mixture structural and durability properties. The structural and durability properties will be determined for varying RAP percentages to illustrate any detrimental effect of high RAP percentages and/or varied binder grades.<br><br><b>Outcome: Re-evaluation of current recommendations for RAP percentages and binder grade.</b>                                                                                                       | Samuel Carpenter & Imad Al-Qadi | Geoff Roberts, Hasan Ozer, & Qazi Aurangzeb   | Jim Trepanier    | Active    |
| <b>Development of an Improved Specification for Maximum Plastic Concrete Temperatures</b>                    | R27-38       | This project is investigating the effects of high plastic concrete temperature on the performance and properties of concrete. After determining the temperature specifications used by other states and best practices with regard to warm temperatures and concrete properties, laboratory tests will be conducted to examine particular effects of high plastic concrete temperature on performance and properties of concrete. A better understanding of the effects of higher temperatures on fresh and hardened concrete properties will be gained.<br><br><b>Outcome: Developing improved specifications and procedures to assure quality of concrete placed at higher temperatures in Illinois.</b>                                                                    | John Popovics & Jeffery Roesler | Carrie Peterson & Andres Salas                | Derek Parish     | Active    |
| <b>Performance of I-57 Recycled Concrete Pavement</b>                                                        | R27-41       | The state of Illinois first used recycled concrete aggregate (RCA) 20 years ago to rehabilitate a section of I-57. This project summarized and documented this pavement section's performance and compared it to similarly aged and trafficked continuously reinforced concrete pavements (CRCP) in Illinois. The project's tasks included: a structural evaluation of I-57 CRCP using distress surveys collected by IDOT, a functional evaluation of I-57 CRCP using friction and IRI data collected by IDOT, and an evaluation to check for the presence of alkali-silica reaction (ASR) or any other deleterious reaction.<br><br><b>Outcome: Validated the future use of recycled concrete aggregate in Illinois while documenting considerations for implementation.</b> | Jeffery Roesler                 | Greg Huntley                                  | Mark Gawedzinski | Completed |
| <b>Thin Long-Lasting High Friction Surface Layer</b>                                                         | R27-42       | The intention of this study is to develop a new surface cross section that utilizes locally available aggregate materials as much as possible. This requires a fresh look at hot-mix asphalt (HMA) cross-section, including the job mix formulae of the composition layers, their engineering characteristics, and cost effectiveness. The surface layer is expected to be efficient and effective regarding noise, durability, friction, and life cycle cost.<br><br><b>Outcome: Developing a cost-effective surface mix design that is durable and provides sufficient friction and possibly lower noise.</b>                                                                                                                                                               | Imad Al-Qadi & Sam Carpenter    | Shih-Hsien Yang, Song Su Song, & Jongeun Baek | Tom Zehr         | Active    |

| PROJECT TITLE                                                                                               | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | PRINCIPAL INVESTIGATOR(S)*                  | RESEARCH TEAM                                         | TRP CHAIR                    | STATUS |
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| <b>Mechanistic-Empirical Design Implementation &amp; Monitoring for Rigid Pavements</b>                     | R27-61       | <p>This project will assist IDOT in moving the proposed continuously reinforced concrete pavement (CRCP) and jointed plain concrete pavement (JPCP) framework into the Bureau of Design and Environment (BDE) Manual. The investigators will also review concrete patching requirements. IDOT has the option to add additional research tasks as the project continues.</p> <p><b>Outcome: Refined design framework for implementation into IDOT's BDE Manual and as-needed research related to IDOT's current practices.</b></p>                                                                                                                                                                                                                                                                       | Jeffery Roesler                             | Amanda Bordelon, Jim Meister, Alex Brand, & Dong Wang | Charles Wienrank             | Active |
| <b>Material Quality Testing Risk Assessment &amp; Multi-State Peer Exchange</b>                             | R27-62       | <p>The objective of this peer exchange is to benchmark Illinois material testing in relation to other states and to determine needed courses of action to limit risk of material quality related failures in a declining staff environment. Illinois can benefit from learning how other states focus their limited staff to keep risks, such as obtaining poor materials and insuring proper materials are being supplied, in check and how their internal testing programs have been modified/reduced/eliminated/maintained/expanded to be in line with the risk of failure of the item.</p> <p><b>Outcome: Determining if Illinois can reduce its level of testing for material acceptance or if the risk warrants continued testing and reestablishment of key testing capability/staffing.</b></p> | Timothy Murphy (Murphy Pavement Technology) | Lisa Taccola                                          | David Lippert                | Active |
| <b>Evaluation of the Long-Term Durability of Joints Cut Using Early-Entry Saws on Rigid Pavements</b>       | R27-63       | <p>This project will establish the current national state-of-the-practice regarding the use of early entry sawing for concrete pavements and discuss how it differs from IDOT's current conventional wet sawing technique. Differences in freeze-thaw durability and resistance to deicers between conventionally sawed joints and early entry sawed joints will be determined. The expected joint durability of no-seal joints when cut using early entry techniques will be evaluated compared to IDOT's standard practice for saw cuts. The joint performance as a function of cut depth and time shall also be considered.</p> <p><b>Outcome: Developing definitive recommendations on whether the early entry sawing technique is viable for IDOT work.</b></p>                                    | Thomas Van Dam & Kurt Smith (APTech)        | James Krustulovich                                    | Mark Gawedzinski             | Active |
| <b>Evaluating Pavement Markings on Portland Cement Concrete &amp; Various Asphalt Surfaces</b>              | R27-77       | <p>This research will evaluate the pavement marking system compatibility with different hot-mix asphalt (HMA) mixtures.</p> <p><b>Outcome: Determined matrix of compatibility of marking systems with different HMA mixtures.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Carmine Dwyer & Bill Vavrik (ARA)           |                                                       | Kelly Morse                  | Active |
| <b>Evaluating the Effects of Various Asphalt Binder Additives/ Modifiers of Moisture Sensitivity in HMA</b> | R27-78       | <p>This research will evaluate the various methods IDOT has used to improve moisture resistance of hot mix asphalt (HMA) pavements, including polymer modification, liquid anti-strip (A-S) additive, polyphosphoric acid (PPA) modified polymer and hydrated lime slurry.</p> <p><b>Outcome: Documented performance of asphalt binder additives/modifiers on HMA pavements.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                    | Imad Al-Qadi & Sam Carpenter                | Ibrahim Abuawad                                       | Jim Trepanier                | Active |
| <b>Designing, Producing &amp; Constructing Fine-Graded Hot Mix Asphalt (HMA) on IL Roadways</b>             | R27-79       | <p>This project will characterize the properties of fine-graded (F-G) mixes in order to provide a fair comparison with course-graded (C-G) mixes, which have been used historically in Illinois and are currently specified (indirectly) by gradation band limits, especially for N90 and N105 mixes.</p> <p><b>Outcome: Improved understanding of F-G mixes and their capabilities for potential cost benefits.</b></p>                                                                                                                                                                                                                                                                                                                                                                                | William Buttlar, Tim Murphy, & Bill Pine    | Ibrahim Abuawad, Eschan Dave, & Tor Chiawat           | Laura Shanley & Matt Mueller | Active |
| <b>Field Performance Evaluations of IL Aggregates for Subgrade Replacement &amp; Subbase - Phase II</b>     | R27-81       | <p>This project will verify the laboratory testing results from the previous ICT study titled, "Characterization of Illinois Aggregates for Subgrade Replacement and Subbase" using full-scale testing with ATLAS.</p> <p><b>Outcome: More economical use of the aggregates in Illinois by either reducing thickness or avoiding aggregate failures.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                            | Erol Tutumluer                              | Deb Mishra                                            | Greg Heckel                  | Active |

| PROJECT TITLE                                                      | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PRINCIPAL INVESTIGATOR(S)*                            | RESEARCH TEAM                                               | TRP CHAIR     | STATUS    |
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| Best Practices for Implementation of Tack Coat TRP Recommendations | R27-100      | <p>This project will focus on the optimum application rate of tack coat in the field from the outcome of ICT project R55. The tasks include: developing the best practice, potentially modifying equipment to allow tack coat application without construction delays, minimizing tracking problems in the field, and examining the feasibility of binder application.</p> <p><b>Outcome: Developing guidelines for efficient and effective application of optimum tack coat.</b></p>                                                                                                                                             | Imad Al-Qadi with Bill Pine (Heritage Research Group) |                                                             | Derek Parish  | New       |
| TRAFFIC OPERATIONS & ROADSIDE MAINTENANCE                          |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                       |                                                             |               |           |
| Traffic Operations Lab - Signal Systems Testing                    | R43          | <p>This research evaluated multiple commercial video detection systems (VDS) at signalized intersections under a variety of traffic, weather, and illumination conditions. The comprehensive side-by-side evaluations addressed the limitations of previous studies, which only evaluated VDS one at a time for a limited range of test scenarios.</p> <p><b>Outcome: Developed recommendations and specifications for use of video detections systems in Illinois.</b></p>                                                                                                                                                       | Rahim Benekohal                                       | Ali Hajbabaie, Juan Medina, Hani Ramezani, & Kivanc Avrenli | Yogesh Gautam | Completed |
| Highway Maintenance Manpower Needs Study                           | R27-SP4      | <p>Contrary to two previous studies, which provided fixed static manpower requirements, this project proposed using historical data within computer software so that decision makers can appropriately modify parameters or update historical data. A very important feature is the ability to use the system on a rolling horizon basis, i.e., to obtain the modified manpower requirements at any future point in time. In addition, a what-if analysis was included.</p> <p><b>Outcome: Developed an improved computer- based decision support system for manpower planning in each highway maintenance field section.</b></p> | Yanfeng Ouyang & Diego Klabjan                        |                                                             | Joe Hill      | Completed |
| Online Training Course Prototype                                   | R27-SP10     | <p>This research investigated and prototyped online course delivery methods for IDOT to train flaggers.</p> <p><b>Outcome: Analyzed the costs, benefits, and feasibility of delivering electronic and online training to meet IDOT needs.</b></p>                                                                                                                                                                                                                                                                                                                                                                                 | James Hall (UIS)                                      | Sharon McCurdy Smith, Deborah Antoine, & Ralph Shank        | Kevin Burke   | Completed |
| Radiation Detection Pilot Program                                  | R27-4        | <p>This project evaluated state-of-the-art radiation detection equipment to determine whether this equipment can meet the needs of IDOT and the Illinois State Police. Testing and evaluation was performed under controlled conditions at Argonne National Laboratory as well as in the field.</p> <p><b>Outcome: Recommended radiation detection equipment and techniques for use by IDOT and the Illinois State Police at weigh stations, rest areas, and overpasses.</b></p>                                                                                                                                                  | William Dunn                                          |                                                             | David Johnson | Completed |
| Snowplow Simulator Training Study                                  | R27-SP15     | <p>This research evaluated the effectiveness and cost efficiency of simulation training of IDOT snowplow operators. If deemed practically effective and cost effective, the simulator training could enhance safety, reduce traffic accidents and property damage, and increase driver efficiency through decreased maintenance costs and a reduction in fuel consumption.</p> <p><b>Outcome: Helping IDOT determine if simulation training is worth the expenditure to train snowplow operators.</b></p>                                                                                                                         | Thomas O'Rourke                                       |                                                             | Dave Johnson  | Active    |
| Regional Trans. Data Mgmt. and Archiving System                    | R27-22       | <p>IDOT and other operating agencies covering the transportation system throughout the northeast corner of Illinois have realized it is suboptimal to have several standalone transportation information systems not communicating to each other. The investigators have identified several implementation alternatives and analyzed each one thoroughly.</p> <p><b>Outcome: Providing clear guidance to regional agencies on building a single centralized transportation information system.</b></p>                                                                                                                            | Yanfeng Ouyang                                        | Sharan Dhanaraju                                            | John Benda    | Completed |



| PROJECT TITLE                                                                                  | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PRINCIPAL INVESTIGATOR(S)*            | RESEARCH TEAM                                              | TRP CHAIR         | STATUS    |
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| <b>Wind Powered Electrical Systems for Highway Facilities</b>                                  | R27-31       | <p>The viability of using wind power to provide electricity for rest areas and weigh stations along Illinois highways was investigated. For each proposed wind-energy site, available wind resources (in kilowatt-hours per year) were determined. The study also determined location suitability, upfront cost of building and maintaining wind turbines, and potential cost savings from using wind turbines.</p> <p><b>Outcome: Developed site-by-site recommendations along with an economic analysis for using wind turbines that could reduce IDOT's energy costs while protecting the environment.</b></p>                                                                                                                                                                                                                                                            | Patrick Chapman                       | Piotr Wiczowski                                            | David Johnson     | Completed |
| <b>Rolling Lane Closures</b>                                                                   | R27-32       | <p>This project studied the factors that affect driver behavior around moving work zones. Specifically, the researchers studied pertinent safety parameters that include traveling speed, number and spacing of trucks, buffer distances, and visibility of work crews. The research also included full-scale field experiments in collaboration with the Illinois State Toll Highway Authority and determined energy absorption to predict typical roll-ahead distances of protection vehicles when they are impacted by vehicles of varying sizes and speeds.</p> <p><b>Outcome: Developed recommendations for increasing the safety and effectiveness of moving lane closures.</b></p>                                                                                                                                                                                    | Douglas Steele & William Vavrik (ARA) |                                                            | Aaron Weatherholt | Completed |
| <b>Queue and Users' Cost in Highway Work Zones</b>                                             | R27-33       | <p>This study will develop methods for estimating speed, capacity, delay, queuing, and user's costs for interstate highway work zones where queuing and congestion occurs which will help IDOT to meet the requirements of Work Zone Safety and Mobility Policy that went into effect in fall 2007.</p> <p><b>Outcome: Assuring IDOT's compliance with the Work Zone Safety and Mobility Policy.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Rahim Benekohal                       | Hani Ramezani & Kivanc Avrenli                             | Marshall Metcalf  | Active    |
| <b>Evaluation of Wireless Detection Systems at RR Crossings &amp; Signalized Intersections</b> | R27-58       | <p>This study evaluated the performance of a wireless vehicle detection system (Sensys brand) on measures such as missed calls, false calls, stuck on calls, and dropped calls. Two intersections were used for the evaluation, one of which is close to a railroad grade crossing. The sensor's potential as a backup to inductive loops that control the exit gates operation in a four quad-gate railroad crossing was also assessed. This technology has the potential to improve traffic operation and safety at railroad grade crossings and signalized intersections, reduce train-vehicle crashes at railroad crossings, and increase on-time train operation.</p> <p><b>Outcome: Documented performance ratings for this wireless vehicle detection system for railroad grade crossing locations and signalized intersection for potential use in Illinois.</b></p> | Rahim Benekohal                       | Ali Hajbabaie, Bradly McNair, Juan Medina, & Hani Ramezani | Yogesh Gautam     | Active    |
| <b>Evaluation of Performance of Solar Powered Flashing Beacons</b>                             | R27-59       | <p>This study will evaluate the performance of solar-powered flashing beacons in a variety of lighting conditions, modes of flashing operation, and as the battery charge level decreases in a controlled lab environment. Their compliance with established requirements for flashing beacons will also be evaluated. This technology has the potential to improve traffic safety and operation at intersections, reduce crashes at sites where portable flashing beacons are used, and reduce crashes at stop controlled intersections.</p> <p><b>Outcome: Documenting performance of flashing beacons for potential use in Illinois.</b></p>                                                                                                                                                                                                                              | Rahim Benekohal                       | Ali Hajbabaie & Juan Medina                                | Yogesh Gautam     | Active    |
| <b>Development of a Highway Incident Management Operational &amp; Training Guide</b>           | R27-64       | <p>The goal of this project is to develop a comprehensive highway Incident Management Operational and Training Guide that can be used by multiple agencies to enhance the safety of incident responders and motorists alike; improve the overall operations of highways and interstate corridors; and improve communication, coordination, and cooperation among all incident-responding agencies.</p> <p><b>Outcome: Developing an operational and training guide for all incident responders and related training and informational materials.</b></p>                                                                                                                                                                                                                                                                                                                     | Huaguo Zhou & Ryan Fries (SIUE)       | Zhaofeng Tian & Michael Williamson                         | Geno Koehler      | Active    |

| PROJECT TITLE                                                                                            | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PRINCIPAL INVESTIGATOR(S)*            | RESEARCH TEAM                                | TRP CHAIR                         | STATUS |
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| <b>Rolling Lane Closures -- Phase II</b>                                                                 | R27-72       | This project takes the data and results from the previous ICT project on rolling lane closures and presents it to practitioners from around the state of Illinois to get additional feedback from these subject matter experts. This research will lead to a better understanding of driver behavior around temporary work zones and the factors that significantly affect this behavior. It will bring out industry best practices that can be included in IDOT and other industry standards. The combination of all results will lead to safer working conditions for traffic control personnel and contractor work crews, as well as benefits for the traveling public.<br><br><b>Outcome: Developing specific recommendations to enhance existing standards for moving lane closures.</b> | Douglas Steele & William Vavrik (ARA) |                                              | Aaron Weatherholt                 | Active |
| <b>Clearview Font in Traffic Signs: Assessing IDOT Experiences &amp; Needs</b>                           | R27-75       | This project will inventory the use of Clearview font on traffic signs in Illinois and the issues involved with converting existing signs to Clearview font.<br><br><b>Outcome: Inventory of Illinois signs and plan for converting signs to Clearview font, which improves legibility, and consequently, safety.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Hani Mahmassani (Northwestern)        |                                              | Julia Fox                         | Active |
| <b>LED Roadway Lighting Evaluation &amp; Field Testing</b>                                               | R27-76       | This study will investigate technological advancements in LED roadway lighting to determine applications where IDOT can reduce costs or improve lighting.<br><br><b>Outcome: Quantified benefits and costs of using LED for roadway lighting and recommendations for where to use in Illinois.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Ray Benekohal                         | Kivanc Avrenli, Hani Ranezani, & Juan Medina | Mark Seppelt                      | Active |
| <b>Evaluation of Traffic Flow Monitoring Technologies: Cicero-Midway Smart Corridor Case Study</b>       | R27-91       | This research evaluates and compares a number of existing and potential technologies through pilot deployments in the Cicero-Midway Smart Corridor.<br><br><b>Outcome: Determining the accuracy and relative merits of traffic monitoring and travel time prediction technologies for arterial surface streets.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Jakob Eriksson (UIC)                  |                                              | Jeff Galas                        | Active |
| <b>Performance Evaluation of Snow &amp; Ice Plows</b>                                                    | R27-94       | This project will develop a performance evaluation procedure for snow and ice plow performance, perform field tests on several snow plows and blades, and develop finite element models to synthesize a comprehensive performance database to simulate the plowing process for each blade at the tested speed and compare the simulation results with the test data.<br><br><b>Outcome: Developing a comprehensive performance database that IDOT can use to select snow blades.</b>                                                                                                                                                                                                                                                                                                          | To Be Determined by RFP Process       |                                              | Tim Peters                        | New    |
| <b>Field Evaluation of Smart Sensor Vehicle Detectors at Intersections &amp; RR Crossings</b>            | R27-95       | This research will evaluate the performance of a vehicle detection system at railroad grade crossing locations and signalized intersections.<br><br><b>Outcome: Improving traffic operation and safety at railroad grade crossings and at signalized intersections through accurate detection.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Ray Benekohal                         |                                              | Yogi Gautam & Stan Milewski (ICC) | New    |
| <b>Pedestrian/ Bicyclist Warning Devices &amp; Signs at Hwy.-Rail &amp; Pathway-Rail Grade Crossings</b> | R27-96       | This research will identify and evaluate the effectiveness of existing technology in use at passive and active highway-rail and pathway-rail grade crossings.<br><br><b>Outcome: Fewer incidents between trains and non-motorized users at highway-rail and pathway-rail crossings.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | To Be Determined by RFP Process       |                                              | Kyle Armstrong                    | New    |

| PROJECT TITLE                                                       | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRINCIPAL INVESTIGATOR(S)*                            | RESEARCH TEAM                                        | TRP CHAIR       | STATUS    |
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| <b>PUBLIC TRANSPORTATION/ MULTI-MODAL</b>                           |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |                                                      |                 |           |
| <b>Wireless Internet on Trains</b>                                  | R27-SP8      | <p>This study investigated competing technologies that can bring the vision of providing internet access to passengers on trains closer to reality. The study was a result of the "Broadband Access on Passenger Rail Law" passed by the Illinois Legislature that requires IDOT to develop a plan for ensuring high-speed data access in all passenger rail systems in Illinois at fair and reasonable prices. Experiments were conducted on a 34 mile stretch of the UPN line in the Greater Chicago area. A report submitted to IDOT reviews the results of the experiments, establishes the technical feasibility of providing internet access at a reasonable infrastructural cost, and outlines non-technical issues that need to be considered before this vision can gain acceptance in the marketplace.</p> <p><b>Outcome: Presented conclusions to General Assembly and Governor on December 31, 2007; information remains on file for the state's future consideration.</b></p> | Ramavarapu Sreenivas                                  |                                                      | Mark Kinkade    | Completed |
| <b>Bus-On-Shoulders Study</b>                                       | R27-5        | <p>This study researched the feasibility of Bus on Shoulder (BOS) operations for the northeastern Illinois region as part of congestion management. It included a review of the operational aspects of shoulder use and stakeholder concerns.</p> <p><b>Outcome: Identified the major points to be resolved in order to successfully implement BOS operations and recommended a planning process that addresses the major areas of concern.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Piyushimita Thakuriah & Paul Metaxatos (UIC)          |                                                      | Charles Abraham | Active    |
| <b>Regional Warehouse Trip Production</b>                           | R27-15       | <p>This research surveyed truck traffic and production at large warehouses in Northeast Illinois, which has become an intermodal "epicenter." The final report illustrated the array of distribution activities, supportive truck movements, and meaningful ratios of truck traffic related to business and building profile factors. These factors allow for estimating the truck movement and growth relative to new distribution space being added in the Chicago area.</p> <p><b>Outcome: Provided data and analysis on characteristics of regional distribution centers that will help agencies determine the demand freight transportation has on infrastructure, forecast travel activity, and anticipate additional transportation assets.</b></p>                                                                                                                                                                                                                                 | Jon B. DeVries & Kristin Nance (Roosevelt University) |                                                      | Charles Abraham | Completed |
| <b>Truck Parking Facilities Program Design</b>                      | R27-16       | <p>This study examined the current state of truck parking and rest area facilities in the northeast Illinois region to determine if and how problems from truck parking affect freight transportation infrastructure, safety, and the region's economy and environment. The research identified the causes and consequences of the "nuisance" parking in residential, retail, or manufacturing areas.</p> <p><b>Outcome: Outlined potential solutions for the most common truck parking problems.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Laurence Rohter & Peter Beltemacchi (IIT)             |                                                      | Charles Abraham | Completed |
| <b>Effectiveness of Transit Strategies Targeting Elderly People</b> | R27-17       | <p>This project explored the reasons seniors are reluctant to use public transit and the usefulness of strategies that can improve their perception of the public transit system. The results will help transportation researchers provide seniors with innovative transportation alternatives that help them maintain their independence while also assuring the safety and comfort of other travelers.</p> <p><b>Outcome: Developed strategies to encourage effective transportation solutions for the aging population.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Kouros Mohammadian & Piyushimita Thakuriah (UIC)      | Taha Hossein Rashidi, Dina Muller, & Hussam Alkhatib | Charles Abraham | Completed |



| PROJECT TITLE                                                                                                           | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRINCIPAL INVESTIGATOR(S)*                | RESEARCH TEAM                                                             | TRP CHAIR       | STATUS    |
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| <b>Trip Chaining Behavior of Senior Travelers &amp; Applications to Public Transportation Planning</b>                  | R27-50       | <p>This project builds on a recently completed ICT project, Effectiveness of Transit Strategies Targeting Elderly People. A portion of respondents recruited in the previous project will be surveyed again; and GPS-based trajectories of seniors' travel patterns and trip chaining behavior will be utilized followed by an activity/travel recall interview with the goal of understanding their underlying travel/activity scheduling process. The main objective of this study is to survey travel/activity scheduling behavior of senior citizens in the Chicago region to better understand their trip chaining behavior.</p> <p><b>Outcome: Facilitating more efficient transit services that target senior travelers, positively change their attitude toward public transportation, and help transportation and transit agencies promote effective transportation solutions for an aging population.</b></p>                                    | Kouros Mohammadian (UIC)                  | Joshua Auld, Martina Frignani, & Chad Williams                            | Charles Abraham | Active    |
| <b>Guidelines, Site Selection, and Design for Implementing Truck Parking/Rest Facilities in Chicago's South Suburbs</b> | R27-51       | <p>This project will provide input to support local agencies in their continuing efforts to meet the needs of truckers who provide pickups and deliveries to local manufacturers and other regional commercial operators. The research team will categorize problems; develop a locally responsive design guide and engineering handbook; provide detailed site plans/designs to alleviate delivery problems, including operational issues; address scattered truck parking problems by identifying parking zones on major roads or developing small parking areas on otherwise unusable adjacent sites; and alleviate truck parking by forming agreements with property owners of existing facilities.</p> <p><b>Outcome: Developing handbooks and materials to support and encourage trucking-related commerce in the area of I-80/ eastern Will County while helping to alleviate truck parking problems.</b></p>                                       | Peter Beltemacchi & Laurence Rohter (IIT) | Rong Helen Zhou, Scott Beslow, Hollie Lohman, Jeff Fain, & Tom Montgomery | Charles Abraham | Active    |
| <b>PLANNING/OTHER</b>                                                                                                   |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                                                                           |                 |           |
| <b>Update Condition Rating Survey (CRS) Calculation / Prediction Models</b>                                             | R27-13       | <p>This study revised IDOT's existing Condition Rating Survey (CRS) calculation and prediction models, which are used to estimate future CRS values and the anticipated needs for future rehabilitation, and developed new models to reflect the changes in pavement systems and the rehabilitation and assessment techniques.</p> <p><b>Outcome: Developed more accurate CRS values for IDOT resulting in more accurate projections of future rehabilitation needs.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Yanfeng Ouyang with Laura Heckel (HERE)   |                                                                           | David Felts     | Completed |
| <b>Commercial Vehicle Info. Systems &amp; Networks (CVISN)</b>                                                          | R27-14       | <p>This project developed a Commercial Vehicle Information Exchange Window to exchange motor carrier safety information with other federal and state agencies involved with motor carrier regulation. The project also developed system requirements for a Commercial Vehicle Information System and Networks (CVISN) to exchange motor vehicle information amongst the Department of Transportation, the Secretary of State, and the Department of Revenue. Other project deliverables served to improve vehicle regulations, including a roadside information viewing mechanism; a system for oversize/overweight vehicle permitting, tracking, and mapping; and an input system for the Illinois Department of Revenue's International Fuel Tax Agreement (IFTA) program.</p> <p><b>Outcome: The use of CVISN improves highway safety, streamlines regulation of the trucking industry, and enhances motor carrier efficiency and productivity.</b></p> | Peter Nelson & John Dillenburg (UIC)      | John Hayward                                                              | Chuck Sikaras   | Completed |
| <b>Performance of HMA Overlays in Illinois</b>                                                                          | R27-23       | <p>This study examined a variety of factors that affect the service life of overlays. Specifically, the following attributes were examined: construction year period, location, condition before overlay placement, presence of D-cracking on rigid pavement sections before overlay, underlying concrete type, estimated overlay number, and overlay type.</p> <p><b>Outcome: Documented the impact of the evaluated variables on the performance of HMA overlays based on service life result and developed an extensive database that IDOT can use to further analyze the effects of various attributes on the performance of HMA overlays.</b></p>                                                                                                                                                                                                                                                                                                     | Angela Wolters & Kurt Smith (APTech)      |                                                                           | Jeffrey South   | Completed |

| PROJECT TITLE                                                              | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PRINCIPAL INVESTIGATOR(S)*                                      | RESEARCH TEAM                                                        | TRP CHAIR     | STATUS    |
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| <b>Pavement Program Planning Process Based on Benefit-Cost Analysis</b>    | R27-34       | <p>This project studied successful pavement management programs to understand the state of the practice. Effective (yet simple) mathematical models were developed to support pavement program planning practices. A spreadsheet-based computer program will be developed to serve as a decision-making support tool that facilitates the planning process.</p> <p><b>Outcome: Developed an advanced pavement program planning procedure based on life-cycle benefit-cost analysis.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Yanfeng Ouyang                                                  | Fan Peng                                                             | Jeffrey South | Completed |
| <b>Context Sensitive Solutions Online Training Course Development</b>      | R27-39       | <p>IDOT has already adopted the principles of Context Sensitive Solutions (CSS), an interdisciplinary approach that seeks effective, multimodal transportation solutions by working with stakeholders to develop, build, and maintain cost-effective transportation facilities which fit into and reflect the project's surroundings – its “context”, in the planning, design, construction, and operation of its projects for new construction, reconstruction, or major expansion of existing transportation facilities. Although formal training already exists for IDOT staff and external planners and design professionals, general CSS information also needs to be provided to public stakeholders to promote understanding and full engagement in the CSS process.</p> <p><b>Outcome: Developed an internet-based tutorial training course to provide information on CSS policies and procedures to affected citizens, elected officials, local agencies, interest groups, and other stakeholders of IDOT.</b></p> | James Hall (UIS)                                                | Sharon McCurdy Smith, Deborah Antoine, & Ralph Shank                 | Susan Stitt   | Completed |
| <b>Utah LTAP GIS Software Replication/ Training in IL</b>                  | R27-43       | <p>To meet the federal government's requirements for minimum nighttime retroreflectivity in the Manual on Uniform Traffic Control Devices (MUTCD), ICT worked with the Utah LTAP Center that has created extensive infrastructure management GIS software for use by local agencies in Utah. Several of the modules were suitable for Illinois use immediately, while some enhancements were needed. Working with Utah LTAP staff, the necessary minor modifications were made to existing modules, a roadside hardware module was developed, and a training plan was developed.</p> <p><b>Outcome: Customized infrastructure management GIS software for use in Illinois and developed a training plan.</b></p>                                                                                                                                                                                                                                                                                                            | Yanfeng Ouyang                                                  |                                                                      | Kevin Burke   | Completed |
| <b>Travel Demand Modeling for Small &amp; Medium Size MPOs in Illinois</b> | R27-48       | <p>This research will establish the framework necessary for the development, maintenance, and application of small and medium size Metropolitan Planning Organization (MPO) urban travel demand models in several communities in Illinois, which will constitute the foundation for a statewide travel demand model. These models will help small and medium size communities assess transportation system performance, analyze deficiencies, and develop long range plans.</p> <p><b>Outcome: Facilitating the creation of a statewide travel demand model.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Paul Metaxatos (UIC) & Rita Morocoima-Black (Champaign Co. RPC) |                                                                      | Susan Stitt   | Active    |
| <b>Distance Technology Transfer Course Content Development</b>             | R27-73       | <p>Decreasing staff and increasing travel costs have limited IDOT's ability to deliver technical training in a timely and accessible manner. This project will develop course content for distance learning in an online environment for several key, high-benefit IDOT technology transfer training courses and short courses. The project team will fully develop and deploy online at least one IDOT technology transfer course in the early stages of the project so IDOT can assess functionality and applicability to other technology transfer programs. The first fully deployed course will serve as a prototype in addressing technical and implementation issues.</p> <p><b>Outcome: Implementing accessible and flexible distance training which enables individuals to take courses anytime and anywhere through the Internet and/or other electronic media.</b></p>                                                                                                                                           | James Hall (UIS) & William Buttlar                              | Deborah Antoine, Sharon McCurdy Smith, Josh Houston, and Meg Griffin | Kevin Burke   | Active    |

| PROJECT TITLE                                                                             | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PRINCIPAL INVESTIGATOR(S)*                                                             | RESEARCH TEAM                                | TRP CHAIR       | STATUS    |
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| <b>Goods Movement Study in IL: Applications to Freight Transportation &amp; Logistics</b> | R27-83       | <p>This study will conduct a new disaggregate national level survey with a focus on Illinois that will facilitate analysis of freight shippers in Illinois and the Midwest region and their interactions with the rest of the country.</p> <p><b>Outcome: Providing a new and highly disaggregate freight dataset that is needed for modeling more realistic decision making processes for more efficient freight movement.</b></p>                                                                                                                                                                                                                                                                                                                                                          | Kouros Mohammadian (UIC)                                                               | Amir Samimi, Josh Auld, & Mahmoud Javanmardi | Michael Garcia  | Active    |
| <b>Develop Travel Reliability Inventory for Highway Networks</b>                          | R27-84       | <p>This project will develop necessary procedures and computer tools to systematically document travel reliability information for highway networks. This information will be used to help personal travelers, freight carriers, and emergency responders better prepare for unexpected delays and to monitor and evaluate the performance of highway networks.</p> <p><b>Outcome: Developing a software tool to analyze and visualize traffic data and generate travel reliability inventories.</b></p>                                                                                                                                                                                                                                                                                     | Peter Nelson & John Dillenburg (UIC) & Yu Nie (Northwestern)                           |                                              | Jeff Galas      | Active    |
| <b>Implementing Pavement Management Systems for Local Agencies</b>                        | R27-87       | <p>This project will provide input to support local agencies as they select a pavement management system (PMS). The team will document the process agencies follow to implement a PMS; this process includes agency staffing, existing pavement inventory, type of condition rating, vendor support, pavement management system capabilities, and pricing. A selection matrix will be developed to determine the key functions/attributes the agency needs to successfully implement a PMS.</p> <p><b>Outcome: Providing guidelines for local agencies to implement a PMS so they can enjoy cost savings and better performing pavement over time.</b></p>                                                                                                                                   | Angela Wolters & Kathryn Zimmerman (APTech) with Kerrie Schattler (Bradley University) |                                              | Kevin Burke     | Active    |
| <b>ENVIRONMENT</b>                                                                        |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                        |                                              |                 |           |
| <b>Update the Illinois Carbon Monoxide Screen for Intersection Modeling (COSIM)</b>       | R27-7        | <p>In 2007, regulatory changes in the Illinois Vehicle Inspection and Maintenance Program prompted the Illinois Environmental Protection Agency (IEPA) to recommend that IDOT update the CO Screen for Intersection Modeling (COSIM) with new emission factor tables using the MOBILE6.2 model. Based on that recommendation, this study was implemented to update the COSIM model. As part of the update, IDOT also requested that the methodology used in creating the original criteria be reevaluated and possibly revised based on the findings of the evaluation.</p> <p><b>Outcome: Updated COSIM User's Manual, which is now titled "Illinois COSIM Version 3.0 Carbon Monoxide Screen for Intersection Modeling Air Quality Manual."</b></p>                                        | Scott Peters (Private Consultant)                                                      |                                              | Walt Zyznieuski | Completed |
| <b>Documenting Air Toxics in NEPA Documents: A Midwest Peer Exchange</b>                  | R27-10       | <p>To address the many uncertainties with FHWA's Interim Guidance for documenting mobile source air toxics (MSAT) released February 3, 2006, IDOT convened a meeting of six Midwestern states (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) to discuss the technical and practical issues and uncertainties arising from the new MSAT guidance and to exchange ideas and experiences in documenting MSATs. This meeting was held on October 5-6, 2006, at Allerton Park, Monticello, Illinois. Twenty-one participants from the six state DOTs, FHWA, U.S. EPA Region 5 Office, Illinois EPA, and UIC attended the meeting.</p> <p><b>Outcome: Documented challenges in practice, research needs, and practical guidelines for use by Illinois and other state DOTs.</b></p> | Jie Lin (UIC)                                                                          |                                              | Walt Zyznieuski | Completed |

| PROJECT TITLE                                                                                             | PROJECT CODE | OBJECTIVE/ OUTCOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PRINCIPAL INVESTIGATOR(S)*      | RESEARCH TEAM                     | TRP CHAIR      | STATUS    |
|-----------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------|-----------|
| <b>Particulate Material (PM) 2.5 &amp; PM10 Hot Spot Analysis: Midwest Peer Exchange</b>                  | R27-29       | On October 23-24, 2007, subject matter experts on particulate matter (PM) gathered at Allerton Park in Monticello, Illinois to exchange ideas and experiences about estimating future localized pollutant concentrations and comparing those concentrations to the National Ambient Air Quality Standards (NAAQS) set by the U.S. EPA. The attendees included staff from five Midwestern state DOTs, metropolitan planning organizations, the U.S.EPA, the Illinois EPA, University faculty, and the FHWA. The attendees identified hot-spot (areas of possible violation) requirements and discussed PM modeling uncertainties, monitoring of PM, and how to document the analyses in reports.<br><br><b>Outcome: Documented challenges in practice, research needs, and practical guidelines for particulate matter for use by all state DOTs.</b> | Jie Lin (UIC)                   |                                   | Walt Zyzniwski | Completed |
| <b>Storm Water Pollution, Erosion &amp; Sediment Control Products Demonstration &amp; Training Center</b> | R27-54       | This project will establish a research and training center at the University of Illinois that will demonstrate erosion, sediment, and storm water control practices suitable to Illinois conditions. The center will be used for hands-on training, to demonstrate proper installation and evaluation techniques, and to initiate research to assess the applicability of erosion control and storm water management best management practices for relevant IDOT site conditions.<br><br><b>Outcome: Providing IDOT the ability to evaluate and demonstrate, under controlled conditions, proposed erosion control products and methodologies.</b>                                                                                                                                                                                                   | Prasanta Kalita & Richard Cooke | Robin Bhattarai & Joseph Monicals | Thomas Ripka   | Active    |
| <b>Midwest Transportation Air Quality Summit</b>                                                          | R27-68       | This project supports a regional workshop on transportation and air quality issues in the Midwest to be attended by representatives of state DOTs, state air pollution control agencies, metropolitan planning organizations, and federal agencies. The goal is to bring together stakeholders from the transportation and air quality communities to discuss current and upcoming environmental challenges. Timely and relevant research will be presented, and an open dialogue and collaborative problem solving with a wide range of perspectives will be encouraged.<br><br><b>Outcome: Providing support to states as they work to comply with federal air quality standards for ozone and particulate matter, reduce the impacts of hazardous air pollutants, and address climate change.</b>                                                 | Michael Koerber (LADCO)         |                                   | Walt Zyzniwski | Completed |
| <b>“Green Friendly” Best Management Practices (BMP) for Interstate Rest Areas</b>                         | R27-74       | This project will investigate, determine, and provide a list of “Green Friendly” Best Management Practices for use at the interstate rest areas.<br><br><b>Outcome: Recommended practices to save energy (dollars) and be environmentally aware.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Khaled El-Rayes & Liang Liu     | Moatassem Abdallah & Ibrahim Odeh | Craig Mitckes  | Active    |
| <b>Transportation Conformity Particulate Matter Hot-Spot Air Quality Modeling</b>                         | R27-93       | This research will model various vehicle traffic volumes and percent diesel trucks to predict pollutant concentrations and compare these concentrations with national air quality standards.<br><br><b>Outcome: Helping IDOT determine which proposed construction projects pose threats to air quality to keep Illinois in compliance with national standards.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To Be Determined by RFP Process |                                   | Walt Zyzniwski | New       |



## COMMONLY USED ACRONYMS

**AASHTO:** American Association of State Highway and Transportation Officials

**ACI:** American Concrete Institute

**APTech:** Applied Pavement Technology, Inc.

**ARA:** Applied Research Associates, Inc.

**ASCE:** American Society of Civil Engineers

**ATLAS:** Accelerated Testing Loading ASsembly

**DOT:** Department of Transportation

**EPA:** Environmental Protection Agency

**ERI:** Engineering & Research International, Inc.

**FHWA:** Federal Highway Administration

**FY:** Fiscal Year

**HERE:** Heckel Engineering, Research, and Education, Inc.

**HMA:** Hot-mix asphalt

**ICC:** Illinois Commerce Commission

**ICT:** Illinois Center for Transportation

**ICHR:** Illinois Cooperative Highway Research (Program)

**IDOT:** Illinois Department of Transportation

**IIT:** Illinois Institute of Technology

**ISP:** Illinois State Police

**LADCO:** Lake Michigan Air Directors Consortium

**PI:** Principal Investigator

**RPC:** Regional Planning Commission

**SIUE:** Southern Illinois University at Edwardsville

**TAG:** Technical Advisory Group

**TRB:** Transportation Research Board

**TRP:** Technical Review Panel

**UIC:** University of Illinois at Chicago

**UIS:** University of Illinois at Springfield

**UIUC:** University of Illinois at Urbana-Champaign







You may visit or contact us at:

Illinois Center for Transportation  
University of Illinois at Urbana-Champaign  
1611 Titan Drive  
Rantoul, IL 61866  
(217) 893-0705  
Fax: (217) 893-0601



Illinois Department of Transportation

