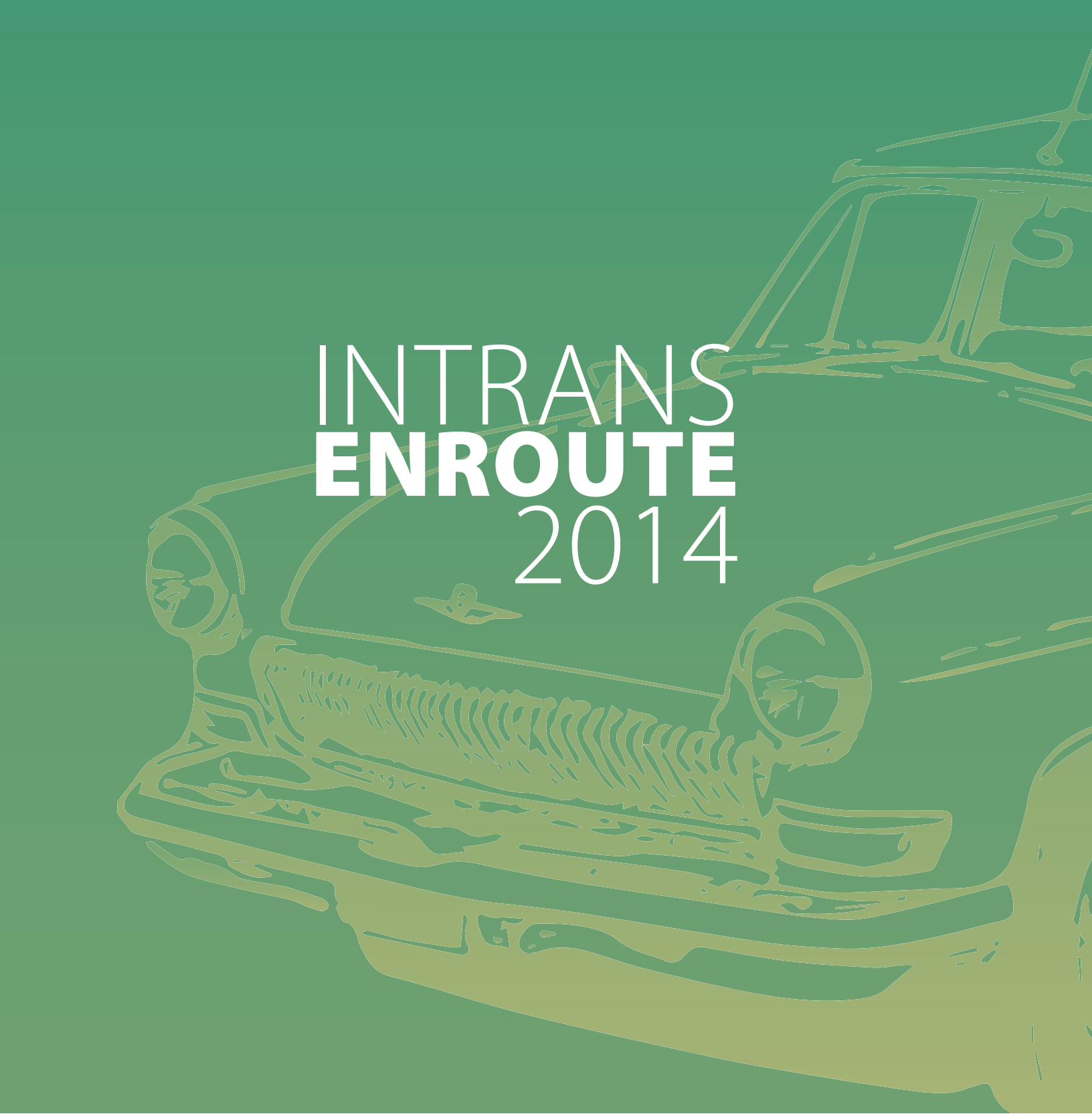


INTRANS ENROUTE 2014

IOWA STATE UNIVERSITY
Institute for Transportation

MANAGING EDITOR MARCIA BRINK • **DESIGNER** STEPHEN POST • **PUBLISHED** APRIL 2015

Hello,

The short news stories on the following pages shine a spotlight on just of few of the activities and accomplishments at InTrans during 2014. I hope they give you a sense of what this place is about and what we've been up to recently.

But first, for those of you who are new to InTrans, here's some background.

Iowa State University's Institute for Transportation (InTrans) provides a physical home and programmatic/administrative support for 16 synergistic transportation-related centers and programs. To varying degrees, these programs create, share, and apply knowledge related to their specific focus areas, from transportation infrastructure to policies and procedures to traffic engineering and safety.

A few centers and programs at InTrans have some long-term funding. Most, however, depend all or in part on winning and conducting competitive grants in order to accomplish their work and grow their influence and activities.

To do that, we assemble world-class teams led by nationally and internationally respected leaders in their fields. We assist those teams with talented professional and scientific staff support and advanced technologies, facilities, and services like professional publications assistance.

Time after time, grant after grant, our project teams deliver innovative and effective results, products, and services.

Proof is in the increasing number and stature of projects we are awarded each year. In 2014, InTrans's more than $12 million budget included 6 National Cooperative Highway Research Board–sponsored projects, 6 Strategic Highway Research Program–2 projects, 7 U.S. Department of Agriculture/Forest Products Laboratory projects, and 49 Federal Highway Administration–sponsored projects, including one cooperative agreement covering a host of initiatives related to concrete pavements. More than 30 percent of our total budget comes from federal sources.

Yet, our bread-and-butter research and outreach projects continue to be funded by state highway agencies, particularly the Iowa Department of Transportation (see page 3).

This level of activity supported 96 graduate students in 2014, a more than 30 percent increase over the previous year. To get the work done, we established partnerships with four new civil engineering faculty affiliates—leading experts in their fields—bringing the total number of faculty affiliates to 34. We also added professional and scientific staff with expertise in bridges, pavements, and outreach. To accommodate all the action, in 2014 we expanded our office and meeting rooms, moving into an additional 3,100 square feet of physical space.

I invite you to see more of what's happening at InTrans; see www.intrans.iastate.edu/. And I hope you enjoy the stories.

Time after time, grant after grant, our project teams deliver innovative and effective results, products, and services.

Shauna L Hallmark

Shauna Hallmark
Director, Institute for Transportation
Director, Midwest Transportation Center
Professor of Civil, Construction, and Environmental Engineering

NEW FACILITY
BRINGS TRAFFIC OPERATIONS HOME TO INTRANS

Reflecting its commitment to helping the Iowa Department of Transportation (DOT) improve traffic operations throughout the state, the Institute for Transportation (InTrans) recently opened the doors of its new Traffic Operations Laboratory. The teaching and research lab, which launched in October 2014, houses state-of-the-art technologies and provides real-time operations data.

The lab is a partnership of InTrans's Center for Transportation Research and Education (CTRE), the Iowa DOT, and Iowa State University's Department of Civil, Construction, and Environmental Engineering (CCEE).

Neal Hawkins, director of CTRE, says the lab offers a unique opportunity to conduct interdisciplinary projects that extend beyond traditional research. It also provides a venue for teaching graduate-level courses that expose students to real-time operations. The lab's functions will continually evolve to meet the needs of the Iowa DOT as well as ISU faculty, staff, and students.

Sandra Larson, director of the Iowa DOT's Systems Operations Bureau, calls the enterprise a "great opportunity to address the needs of the public."

"DOTs across the country are realizing that our customers, the public, care a lot about mobility, about reliability," Larson says.

For more information contact Neal Hawkins, CTRE director, hawkins@iastate.edu

PARTNERING WITH STATES TO ADDRESS MAJOR NATIONAL **SAFETY CHALLENGES**

Along with three state department of transportation (DOT) partners, the Center for Transportation Research and Education (CTRE) at the Institute for Transportation (InTrans) has been awarded three national safety-related projects. The projects are sponsored by the Implementation Assistance Program (IAP), the implementation phase of the second-generation Strategic Highway Research Program (SHRP2).

Building on expertise gained through several major SHRP2 awards, CTRE partnered with the Iowa, Minnesota, and Michigan DOTs to identify and submit priority project proposals to Federal Highway Administration and its IAP partners, the American Association of State Highway and Transportation Officials and the Transportation Research Board.

A total of 25 projects from around the country were considered in the safety focus area. CTRE heads up the research teams for 3 of only 11 projects awarded:

- Identify driver characteristics and roadway features that play the most significant role in road departure crashes (Iowa DOT)
- Evaluate the roles of speed and driver distraction in work zone crashes (Minnesota DOT)
- Determine the effects of distracted driver behavior and speed limit enforcement on crashes (Michigan DOT in partnership with Wayne State University)

A major factor in winning these awards was how well CTRE staff collaborate with state DOTs, according to Shauna Hallmark, principal investigator in two of the three projects.

"We worked hand in hand with the DOTs to identify their top research priorities and put the proposals together," Hallmark says.

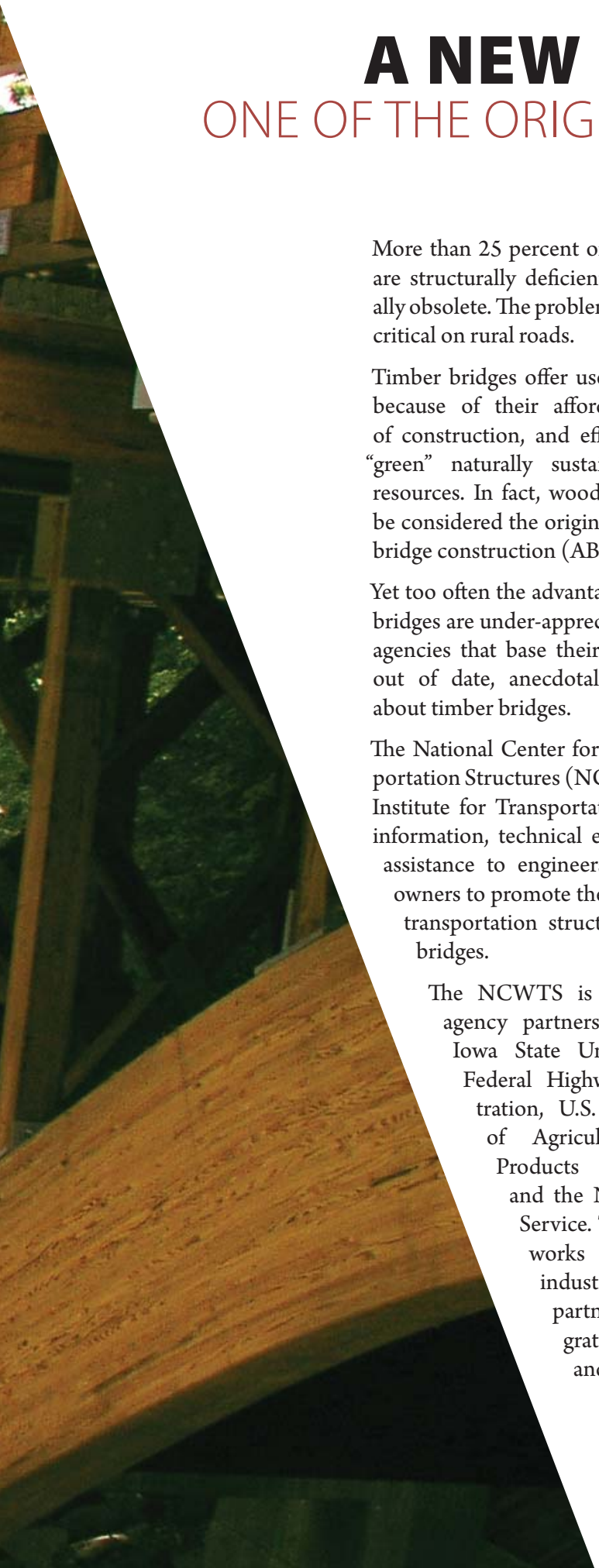
"Not all research organizations have the same level of experience and ease in partnering with state agencies. . . . It's even more impressive when you think that we're working with three different DOTs."

For more information contact Shauna Hallmark, InTrans director, shallmar@iastate.edu, Omar Smadi, CTRE transportation research scientist, smadi@iastate.edu, or Peter Savolainen, CTRE transportation safety engineer, pts@iastate.edu

Working hand-in-hand with state agencies

One of the secrets to InTrans's success is its strong relationships with DOTs, as exemplified by our success in the SHRP2 Implementation Assistance Program.

In 2014 InTrans was actively working on almost 190 projects funded by state highway agencies. Most were sponsored by the Iowa and Minnesota DOTs, with whom InTrans has ongoing research management agreements. But we also conducted research funded by Alaska, California, Missouri, Ohio, and Wisconsin. And we participated in 11 pooled fund studies with a total of 32 state DOTs.



A NEW LOOK AT WOOD

ONE OF THE ORIGINAL BRIDGE-BUILDING MATERIALS

More than 25 percent of U.S. bridges are structurally deficient or functionally obsolete. The problem is especially critical on rural roads.

Timber bridges offer useful solutions because of their affordability, ease of construction, and efficient use of "green" naturally sustainable forest resources. In fact, wood bridges may be considered the original accelerated bridge construction (ABC) option.

Yet too often the advantages of timber bridges are under-appreciated by road agencies that base their opinions on out of date, anecdotal information about timber bridges.

The National Center for Wood Transportation Structures (NCWTS) at the Institute for Transportation provides information, technical expertise, and assistance to engineers and bridge owners to promote the use of wood transportation structures such as bridges.

The NCWTS is a university-agency partnership between Iowa State University, the Federal Highway Administration, U.S. Department of Agriculture Forest Products Laboratory, and the National Park Service. The NCWTS works directly with industry and agency partners to integrate university and government research and provide the bridge community with current, relevant, and applicable timber bridge information and support. It also supports a national demonstration and technology transfer program.

For one demonstration project that will culminate in summer 2015, the NCWTS is leading the design, development, construction, and monitoring of the first glulam timber bridge on geosynthetic reinforced soil, integrated bridge system abutments to be constructed in Iowa.

"Glulam" is glue laminated timber, an engineered wood product consisting of individual structurally graded laminations of wood, usually two inches thick or less, bonded together. This engineered timber not only is stronger than its solid sawn predecessor but also, if properly maintained and inspected, has a service life that spans 70-plus years. In addition, glulam can be fabricated in many shapes and sizes. Another advantage is that glulam structures are lighter than traditional bridge construction materials such as concrete and steel, resulting in less dead load on the substructure and thereby requiring smaller (both in size and quantity) construction equipment. Glulam bridges are easily constructed by both experienced bridge contractors or a county bridge crew to save additional costs.

For more information contact
Travis Hosteng, NCWTS director,
kickhos@iastate.edu

PATENT-PENDING
BRIDGE ASSESSMENT TECHNOLOGIES

Over the years the manner in which bridge conditions are evaluated has undergone many transformative evolutions. One of the most important developments was in the late 1960s following the historic and unfortunate collapse of the Silver Bridge across the Ohio River, which helped spur the creation of the National Bridge Inspection Standards.

Researchers at the Institute for Transportation's Bridge Engineering Center are helping lead some of today's most innovative developments in the bridge evaluation evolution. Examples include two continuous, autonomous bridge evaluation technologies. Both are in the final stages of receiving patent protection.

One new technology includes custom computer algorithms for determining when and where changes in structural behavior have occurred. This technology uses a combination of statistical and structural parameters to determine when a change has occurred and whether or not the change is significant.

The other new technology assesses the safe load-carrying capacity of bridges after the passage of a common semi-truck.

Both technologies are being beta tested on bridges across the country, and the researchers are looking for commercialization opportunities.

For more information contact
Brent Phares, BEC director,
bphares@iastate.edu

THE ABCS OF (FAST) BRIDGE CONSTRUCTION

The challenge: One out of every four publicly owned bridges in the United States is either structurally deficient (based on its condition) or functionally obsolete (based on current standards). Many of these bridges simply need to be reconstructed or replaced. Using traditional methods, however, bridge reconstruction or replacement can result in months of bridge or road closures, detours, and work zones.

The good news: Recent developments in accelerated bridge construction (ABC) such as slide-in bridge construction, prefabricated bridge elements and systems, etc., can reduce such delays—and the related safety problems, inconveniences, and costs—from months to weeks, even days.

The not-so-good news: The traveling public isn't experiencing the full benefits of ABC. In some cases, agencies haven't yet adopted ABC technologies and processes due to a lack of knowledge and/or experience. In other cases—for example, in areas prone to high seismic activity/earthquakes—there are technological or logistical obstacles to ABC. Finally, ABC technologies are still being developed to repair and renew (rather than replace or reconstruct) bridges when appropriate. Additional ABC technologies related to repair and rehabilitation are needed.

To address these issues, the Bridge Engineering Center (BEC) at the Institute for Transportation is part of a recently formed, U.S. Department of Transportation supported University Transportation Center (UTC) focusing on the development and deployment of ABC technologies and policies. Iowa State University (ISU) has long been nationally recognized for its bridge engineering program, which emphasizes ABC.

Housed at Florida International University (FIU), the ABC-UTC consortium includes FIU, ISU, and the University of Nevada, Reno. The consortium conducts research, education, and technology transfer that will ultimately lead to more widespread use of ABC—all with the ultimate goal of dramatically reducing the duration of bridge projects.

A highlight of the ABC-UTC is its annual Accelerated Bridge Construction Conference in December. More than 750 people participated in the 2014 event.

For more information contact Brent Phares, BEC director, bphares@iastate.edu

STANDARDIZING URBAN IMPROVEMENTS ACROSS IOWA

Iowa is unique in having statewide design guidelines and standard specifications for urban public improvements. This is due, in large part, to the diligent efforts of the Statewide Urban Design and Specifications (SUDAS) program at the Institute for Transportation.

The program maintains two manuals, one on design and one on specifications. Updates in 2014 include new pavement preservation design sections, updated accessible sidewalk requirements, new construction survey specifications, and draft design guidance for implementing "complete streets" standards.

The original effort in the late 1980s that eventually became SUDAS served only 18 central-Iowa cities and counties. In 2014, by contrast, SUDAS distributed the latest update of its standard specifications manual to more than 1,200 communities and companies across this state. This is about 400 more than were distributed 10 years ago—a strong indication of the growing use of SUDAS specifications.

How does it work?

SUDAS staff meet three times a year with, all together, about 100 volunteers representing cities, counties, and the Iowa Department of Transportation (DOT) from six district committees. The goal is to reach consensus on revisions and additions to the manuals before presenting the changes to a 38-member board of directors for final approval.

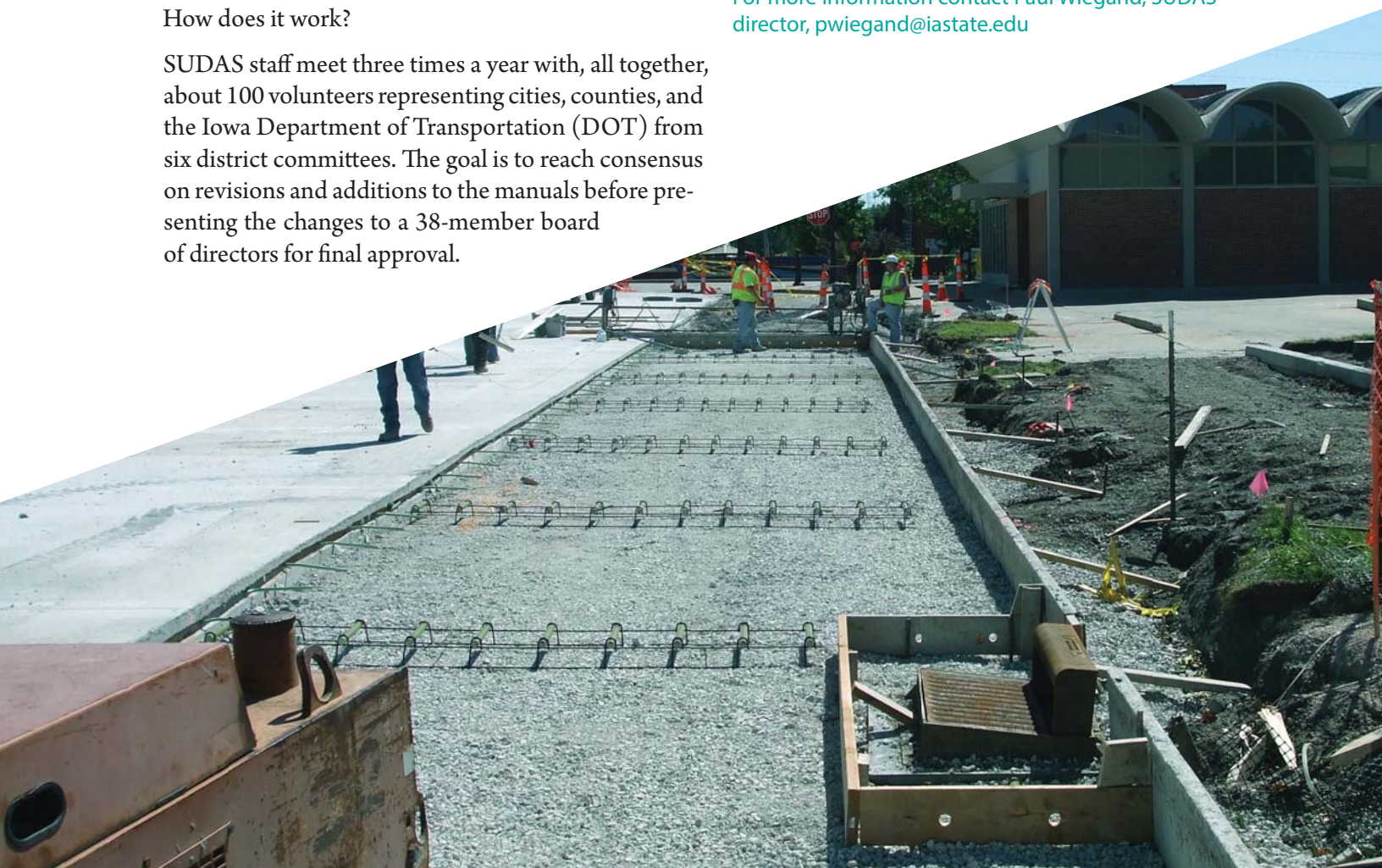
Why uniform standards?

Iowa's urban communities do not have to adopt the SUDAS manuals. By adopting them, however, local jurisdictions are relieved of having to develop their own. Plus, when designs and specifications are consistent from community to community, more contractors tend to bid on improvement projects because they know what to expect. Also, construction mistakes are reduced. These last two factors are estimated to save millions of dollars statewide each year.

In addition, SUDAS and the Iowa DOT have developed many common, uniform specifications, figures, and design standards for use by both organizations.

"The SUDAS program is unique in the country and is the overall standard for urban public improvements in Iowa. It is the best means of stretching limited public improvement dollars," says Paul Wiegand, SUDAS director.

For more information contact Paul Wiegand, SUDAS director, pwiegand@iastate.edu



PROVIDING USEFUL TOOLS
FOR TACKLING COMPLEX RENEWAL PROJECTS

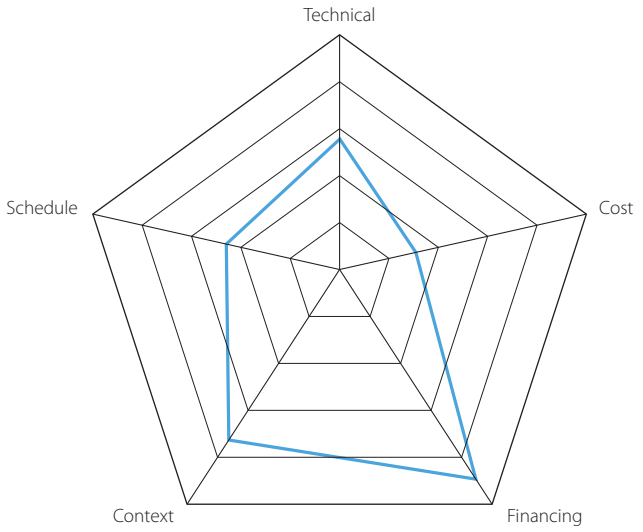
Challenge: The issues involved in managing infrastructure renewal projects are different from those in managing new construction. And "complex" renewal projects, by definition, involve additional issues that may be unpredictable, uncertain, and highly dynamic. With additional pressures to accelerate delivery and reduce costs, traditional project management practices are not always adequate for the challenges and realities of today's complex projects.

Solution: Staff from the Construction Management and Technology (CM&T) program at the Institute for Transportation have developed a straightforward guide with useful tools to help agencies integrate complex project management strategies into existing project management plans and processes.

Details: This work, completed in 2014, was conducted through the second-generation Strategic Highway Research Program (SHRP2) renewal project R10.

After an in-depth study of 15 U.S. and three international projects, the CM&T team focused on a five-dimensional project management (5DPM) approach. The five project dimensions are (1) cost, (2) schedule, (3) technical, (4) context, and (5) financing.

The goal of the 5DPM approach is to manage the variables within each dimension, many of which are outside the project manager's direct control and can vary widely from project to project as well as during the course of a project.



In addition to a research report and guide, research staff developed practical and flexible tools, techniques, and processes to help agencies deploy 5DPM successfully. Agencies can integrate 5DPM into their existing management procedures as narrowly or broadly as they desire. Use of the tools, techniques, and methods is fully scalable and may be as simple or as in-depth as needed.

Through its SHRP2-funded project, the CM&T team conducted multiple training events. All resources, including the guide and presentation slides, were designed for self-implementation and are available through the SHRP2 program.

For more information contact Jennifer Shane, CM&T director, jsshane@iastate.edu

CONTROLLING ROAD CONSTRUCTION PROCESSES AUTONOMOUS AND ROBOTICALLY

Constructing long-lasting roadways requires careful process control. But operating earth compaction equipment, paving machines, and other equipment can be repetitive and often dangerous work that doesn't lend itself to high precision process control.

The use of autonomous and robotically controlled road-building equipment has great potential to solve this problem. For example, state agencies are moving toward 3D design and providing electronic design files to contractors for upload to machines that support automated machine guidance for earthwork grading and for paving.

The Center for Earthworks Engineering Research (CEER) at the Institute for Transportation is studying the impacts of autonomous and robotic-guided equipment on productivity, quality, reliability, and safety in a multidisciplinary project funded by Iowa State University (ISU)'s Midwest Transportation Center and Caterpillar Inc.

First, CEER is hosting an international stakeholder workshop in June 2015 to learn about the current state of autonomous/robotic implementation in roadway construction and to identify opportunities for continued innovation and broader application of these technologies.

Second, CEER staff are conducting several field studies across the country, using the $850,000 CEER/ISU geotechnical mobile lab to collect field data. The goal is to assess the impacts of autonomous/robotic operations on actual projects, as well as to evaluate machine-to-any-machine and machine-to-human proximity awareness and accident avoidance systems.

Some of the types of autonomous/robotic technologies that may be evaluated include the following:

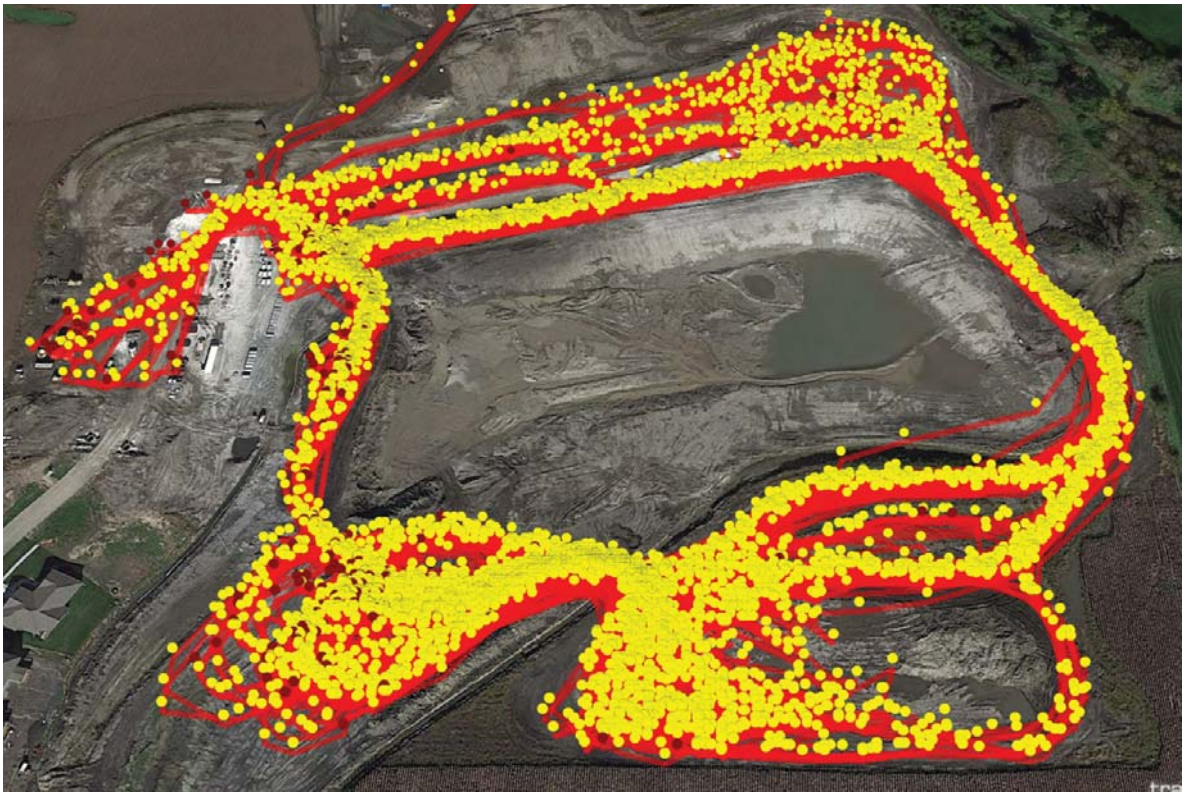
- Wheel loaders and trucks
- Excavators and trucks
- Bulldozers and graders
- Scrapers and push bulldozers

Finally, field study results will be broadly disseminated. Using satellite communications on the geotechnical mobile lab, early results will be broadcast live from project sites to interested stakeholders. Data collected during the study will be made available to national and international researchers online. Key findings will be disseminated via webinar.

For more information contact David White, CEER director, djwhite@iastate.edu, or Pavana Vennapusa, research assistant professor, pavanv@iastate.edu

This article is adapted from one in the May 2015 issue of *Spotlight*, the newsletter of the U.S. DOT University Transportation Center Program

THROUGH
Y CONTROLLED EQUIPMENT



TESTING PAVEMENT FOUNDATION DESIGNS AT THE CENTRAL IOWA EXPO

You can optimize the pavement mix, placement practices, and finishing techniques, but what's underneath the pavement can make all the difference between a long-lasting pavement and one that experiences problems prematurely.

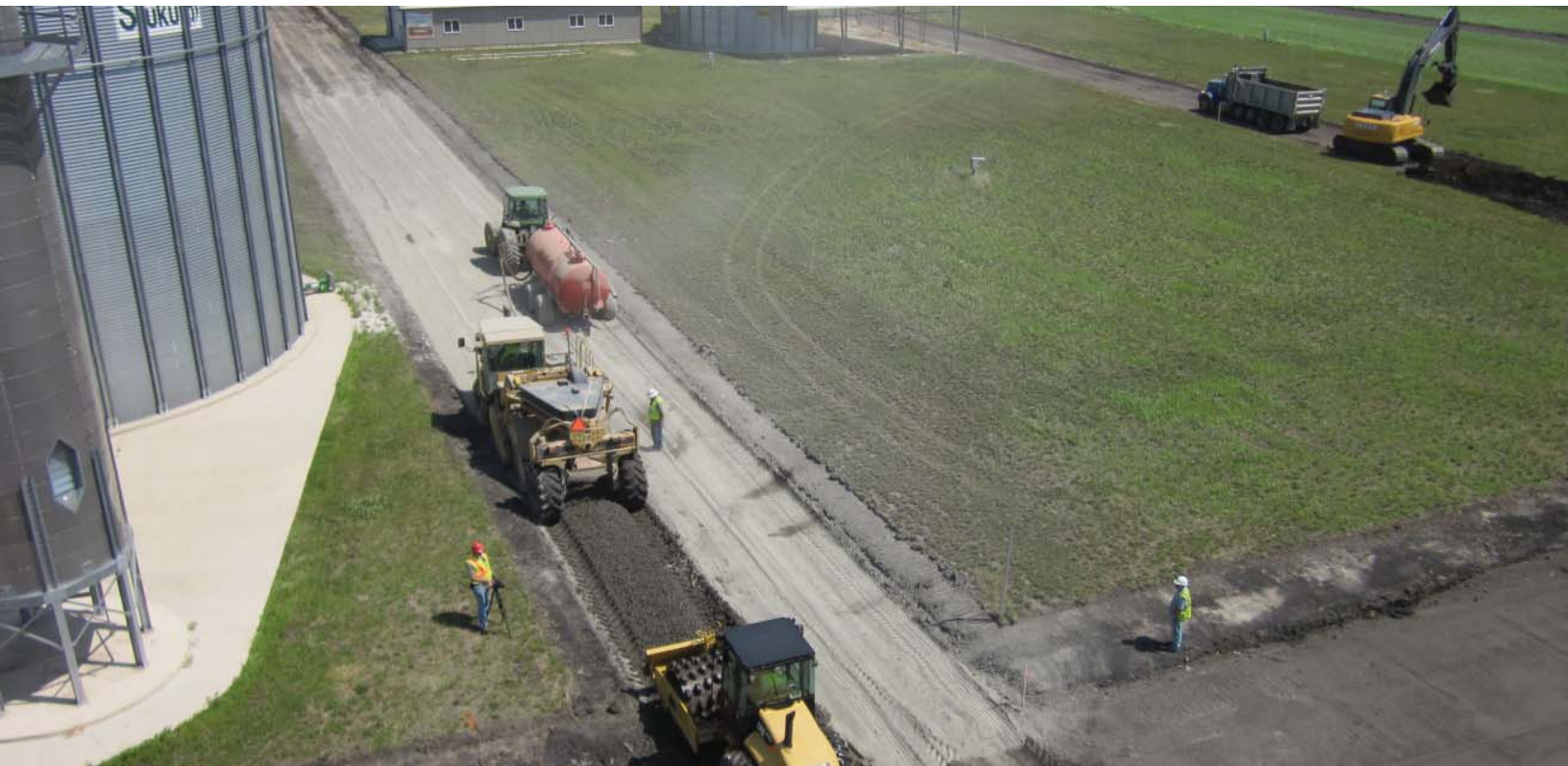
The critical characteristics of a pavement foundation are uniformity and stability. The foundation must provide stable support conditions to the pavement throughout the pavement's service life.

To increase the range of stabilization options for future foundation designs, the Center for Earthworks Engineering Research (CEER) is testing a variety of foundation stabilization technologies and stiffness measurement technologies with a focus on assessing freeze-thaw performance. The project, supported by the Iowa Department of Transportation and Federal Highway Administration, is known as the Central Iowa Expo.

The technologies are being tested on 16 different 700-foot test sections of pavement being reconstructed in Boone County, Iowa:

- Woven and non-woven geosynthetics, as separation layers between the subgrade and subbase, and two different types of geogrids as reinforcement of the subbase layer, plus geocells in the subbase layer for confinement
- Chemical stabilization of subgrade with self-cementing fly ash and portland cement in subgrade and subbase layers
- Two types of fiber reinforcement of subbase, with and without portland cement
- Mechanical stabilization of soil by mixing reclaimed granular subbase material with the subgrade soil on site
- High-energy impact compaction to stabilize existing granular base
- Stiffness-based measurements such as intelligent compaction, falling weight deflectometer, lightweight deflectomer, and dynamic cone penetrometer
- The project is currently under long-term performance evaluation. Seasonal variations in temperature, stiffness, and drainage are being monitored.

For more information contact David White, CEER director, djwhite@iastate.edu, or Pavana Vennapusa, research assistant professor, pavanv@iastate.edu



AN INTERNATIONAL EFFORT TO HELP

ENGINEERS MONITOR ROAD AND BRIDGE CONDITIONS

A future where people can monitor the structural status of bridges, buildings, and roads from a distance, in real time, is coming to life through a collaborative research effort between Iowa State University (ISU) and the University of Perugia in Italy.

At both institutions, students and faculty are developing materials that sense stresses, strains, deformations, or displacements of structures, including buildings, bridges, roads, and even airplane wings. The ISU researchers, including faculty from the Program for Sustainable Pavement Engineering and Research (ProSPER) at the Institute for Transportation, are focusing on developing polymer-based skin sensors, while the Italian researchers are focusing on developing embedded sensors.

Paired with wireless monitoring, such sensing systems can enable early detection of strains on structures, ultimately giving engineers the information they need to prolong the life of the structure or even prevent a disaster.

It is possible, for example, that the I-35W Minnesota Bridge collapse in August 2007 that killed 13 people and injured 145 might have been prevented by the use of embedded and/or skin sensing systems. The new (replacement) bridge was constructed with sensing systems.

Industry is interested in using this technology in roads. The Iowa Department of Transportation wants to use embedded sensors to monitor road conditions as well.

For more information contact Halil Ceylan, ProSPER director, hceylan@iastate.edu

This article is adapted from one by Kelly Schiro, which appeared in the March 27, 2014, issue of Iowa State Daily.com.

Photo by Tomhas Huhnke/Iowa State Daily

INTRANS PARTNERS IN A NEW **NATIONAL CENTER**

Rural road agencies manage 80 percent of the U.S. roadway network, and drivers on rural roads face a disproportionate share of safety risks. For example, more than half of all roadway fatalities occur on rural roads, where emergency response times are 50 percent longer than in urban/suburban areas. Rural roads also experience high run-off-the-road crash rates.

A new National Center for Rural Road Safety is focusing on these safety issues and more. Its goal is to help transportation practitioners in rural road agencies reduce serious injuries and fatalities on the roads they manage.

Funded by a four-year, $4.8 million grant from the Federal Highway Administration and partner support, the center represents a major commitment to enhancing rural road safety. The center offers training, technical support, and information to transportation practitioners around the country.

The new center is a joint effort of the Institute for Transportation (InTrans) and several partner organizations.

It will be housed and led by the Western Transportation Institute at Montana State University. Other partners are the Center for Advanced Infrastructure and Transportation at Rutgers University, Cambridge Systematics, Inc., the IDT Group, and the Four Corners Tribal Technical Assistance Center.

To leverage resources and expertise, the center will work closely with the Iowa Local Technical Assistance Program (LTAP) at InTrans, as well with as with LTAPs in Louisiana, Montana, and New Jersey.

The partner organizations, says Keith Knapp, director of Iowa's LTAP, "have the geographic coverage across the U.S. … to efficiently address safety training and technical assistance needs on a regional basis."

For more information contact Keith Knapp, LTAP director, kknapp@iastate.edu

CELEBRATING PROFESSIONAL DEVELOPMENT THROUGH A NEW **ROADS SCHOLAR PROGRAM**

On September 1, 2014, Iowa's Local Technical Assistance Program (LTAP) at the Institute for Transportation rolled out a new and improved Roads Scholar program that is both more focused and more flexible.

"Among other improvements, the tracks have been revamped," says LTAP director Keith Knapp. "These changes will help us better recognize the commitment of many of Iowa's transportation workers to continuing education."

Some of the changes include the following:

- Automated tracking of Roads Scholar credits for each participant
- Self-registration of participants in the program, with confirmation of continued interest every four years
- Inclusion of the online Public Employees Leadership Institute courses
- Four Roads Scholar recognition levels with new requirements:
  1. Roads Scholar I (40 credit hours)
  2. Senior Roads Scholar II (80 credit hours with four core courses)
  3. Master Roads Scholar (120 credit hours with four designated Public Employees Leadership Institute courses)
  4. Elite Roads Scholar (175 credit hours and the completion of all Public Employees Leadership Institute courses)

Personnel from Iowa's local agencies can register at www.iowaltap.iastate.edu/workshops/road-scholars/.

For more information contact Keith Knapp, LTAP director, kknapp@iastate.edu

BUILDING TRIBAL-AGENCY RELATIONSHIPS & UNDERSTANDING

The interests and responsibilities of Native American tribes and nations and those of state and federal agencies are like the layers of a map. Sometimes they overlap or bump up against each other. Almost always, they affect each other. While federal agency undertakings can sometimes impact historic sites that are significant to native tribes and nations, the Federal Highway Administration (FHWA) and Iowa Department of Transportation (DOT) work hard to avoid and preserve unique Native American sites and landscapes.

In May 2014, Iowa held its second Tribal Summit on Cultural Preservation and Transportation in Ames. The overall goal of the three-day event: Help representatives of Native American tribes and nations in Iowa, state and federal transportation officials, and preservationists optimize their communications about transportation-related projects.

Cultural preservation, in particular, is of primary concern to Native American tribes and nations. Cultural preservation is also an important consideration under the National Historic Preservation Act, which covers all transportation projects.

The summit provided a platform for building trust and respect and helping people get to know each other. It was also a venue for expressing concerns, learning about other organizations and how they work, and identifying areas for which programmatic agreements are needed. Programmatic agreements can enhance project consultation processes to fit the needs of all parties by providing structure and consistency while reducing paperwork and increasing flexibility.

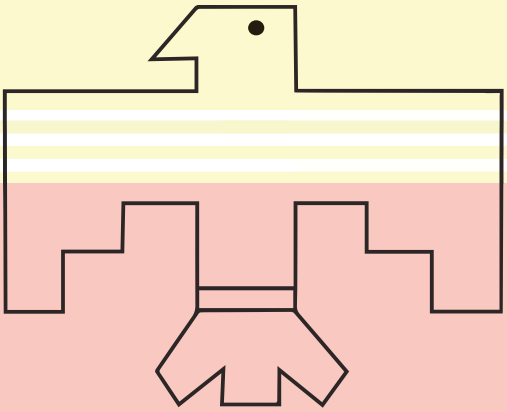
In its role as transportation information disseminator for the state of Iowa, Iowa's Local Technical Assistance Program (LTAP) at the Institute for Transportation helped plan and organize the Summit.

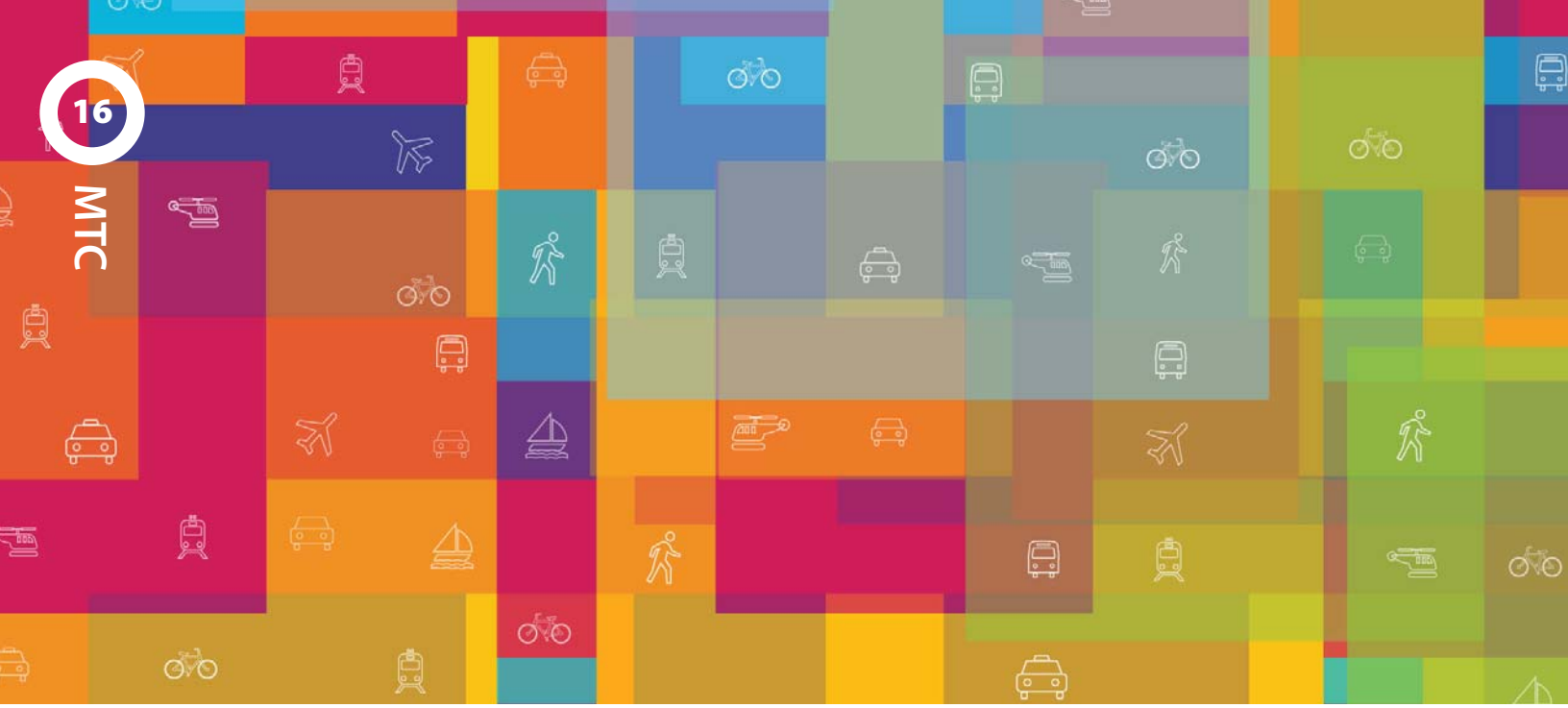
"LTAP's staff were tremendous in support of the summit. They troubleshot a number of issues and were critical to us in pulling a successful event together," said the Iowa DOT's Brennan Dolan, planning chair of the summit.

Approximately 40 people participated in the summit, about half representing Native American tribes and nations. The event was hosted by the FHWA and the Iowa DOT. Other preservation agencies such as the University of Iowa Office of the State Archaeologist and the State Historic Preservation Office also helped support the event.

For more information contact Keith Knapp, LTAP director, kknapp@iastate.edu

Iowa Tribal Summit
on Cultural Preservation
and Transportation





GO!-ING FORWARD
WITH K–12 OUTREACH ACTIVITIES

Other than car mechanics, airline pilots, and truck drivers, young people have little to no understanding of the myriad of careers available in transportation. This fact (the finding of a small survey of Iowa State University students by an Institute for Transportation staffer in 2007) makes it challenging to attract the best and brightest students to transportation careers.

Thus, *Go!* was initiated. This upbeat, online magazine has become the Midwest Transportation Center's (MTC) premier tool for informing young people about careers in transportation and related academic programs. *Go!* sponsors several activities:

Articles. Every week at least one new story is posted on *Go!* and shared via Facebook and Twitter. Recent examples include a three-part series on "exploration"—transportation in space, oceans, and deserts.

E-newsletter. *Go!*'s latest articles and other resources are broadcast to more than 5,000 students, teachers, transportation professionals, and other subscribers.

K–12 partnerships. Working one-on-one with more than 20 science, technology, engineering, and mathematics (STEM) teachers and transportation professionals in Iowa, *Go!* staff are providing articles, video clips, and other resources. *Go!* is also partnering with MTC members Harris-Stowe State University, the University of Missouri–Columbia, and the University of Missouri–St. Louis to reach teachers in Missouri. And, using *Go!*'s "Curriculum Connections" series, teachers across the country can highlight STEM topics in transportation in their classrooms.

Webcomic. In "Dot's Adventures with Transportation" (premiering spring 2015), young people can follow the life and adventures of teenager Dot as she learns about careers in transportation.

Mentor videos. *Go!* recently launched the "My Mentor" video interviews with professionals and graduate students. This series especially focuses on minorities and women in transportation.

Outreach. *Go!* is working with the Iowa Department of Transportation to implement TRAC™ & RIDES in Iowa schools. TRAC™ & RIDES, a national STEM-related educational program produced by the American Association of State Highway and Transportation Officials, provides educational modules to teachers.

For more information contact Brandy Abraham, communication specialist, babraham@iastate.edu

COMING MAY 2015: STUDYING INTERNATIONAL TRANSPORTATION IN **EXOTIC ISTANBUL**

In summer 2014, emails were flying between faculty affiliates at the Institute for Transportation (InTrans) and their counterparts at Boğaziçi University in Istanbul, Turkey. As part of the Midwest Transportation Center's (MTC) focus on academic enrichment, the professors were planning the details—classroom courses, field trips, and sightseeing—of a 2015 study abroad experience for interested students at Iowa State.

Transportation engineering is an increasingly global profession, and international studies significantly enhance students' academic experience. For two weeks in May 2015, participating students will be immersed in global transportation topics at the English-language Boğaziçi University.

A cultural and entertainment hub and a dynamic center of global commerce, Istanbul is a premier location for transportation studies. The city straddles the Bosphorus Straight between Europe and Asia and is served by a complex, modern transportation network, including two international airports, three shipping ports, a "chunnel," and a ferry system.

Four professors from Iowa State University's Department of Civil, Construction, and Environmental Engineering (CCEE)—Shauna Hallmark, Omar Smadi, Chris Williams, and Halil Ceylan—will accompany the students and share instruction with other visiting professors.

This opportunity is being organized by the MTC at InTrans and the CCEE Department.

For more information contact Shauna Hallmark, MTC director, shallmar@iastate.edu

LEADING A PERFORMANCE-BASED APPROACH TO DESIGNING **CONCRETE FOR PAVEMENTS**

Many concrete pavement mixtures in the United States are still developed based on standard, prescriptive "recipes." These methods can be overly conservative as far as defining, for example, minimum strengths, maximum water-to-cement ratios, and minimum cement content. Such requirements often have no direct correlation to optimizing desired pavement performance. Plus, prescriptive approaches may result in other problems, like using more cementitious materials than necessary.

There is another approach. Performance engineered mixtures, or PEMs, are designed and proportioned to optimize readily available materials, minimize the use of reactive materials, provide workable mixtures that set "on cue," and result in pavements that perform as desired within the unique parameters and desired characteristics of individual pavement projects.

The knowledge and technologies to develop PEMs are largely available. But their use has yet to become standard practice.

"It's not that complicated," says Peter Taylor, director of the National Concrete Pavement Technology Center (CP Tech Center) at the Institute for Transportation, who is leading PEM training efforts. He emphasizes three guiding principles for PEMs:

- Choose an aggregate system that minimizes paste content requirements
- Select a paste system based on desired performance characteristics of the pavement
- Proportion the paste volume at 1.5 to 2 times more than voids between aggregates

Staff from the CP Tech Center are spreading the word about PEMs through workshops and other training activities across the country. In addition, Taylor has developed a spreadsheet tool for applying PEM principles.

"A focus on performance engineering will lead to a profound change in the way mixtures are proportioned in the future," says Taylor.

For more information contact Peter Taylor, CP Tech Center director, ptaylor@iastate.edu

PROVIDING ONE-ON-ONE SUPPORT IS **THE KEY TO SUCCESS** FOR CONCRETE OVERLAYS

To help state and local agencies update their practices and adopt new technologies regarding constructing concrete overlays, direct one-on-one support is one of the most effective approaches.

And that's the approach adopted by the National Center for Concrete Pavement Technology (CP Tech Center) at the Institute for Transportation. In cooperation with the Federal Highway Administration, the CP Tech Center is helping highway agencies implement a highly effective, time- and money-saving alternative to costly pavement rehabilitation or reconstruction: concrete overlays.

An expert team from the CP Tech Center offers a menu of direct services to help agencies determine if a concrete overlay is a good solution for a specific asphalt or concrete pavement and, if so, implement it successfully. Services may include the following:

- Site visits with review of evaluation data and design/construction issues such as traffic control criteria and accelerated construction options, then preparation of a detailed report
- Meetings with agency upper management to discuss potential benefits of concrete overlays and answer specific questions
- Workshop on concrete overlay best practices focused on the agency's specific needs
- Follow-up support before, during, and after construction of the overlay

The payoff is significant:

- In 2013 and 2014, the CP Tech Center provided these services to nine states, six of which have begun or are planning overlay projects that will cut costs by an average of 64 percent—an expected savings of approximately $114 million.
- Nationally, construction of concrete overlays (as a percent of total concrete pavement construction) rose from almost zero in 2007 to an average of almost thirteen percent by the end of 2014.

Because of the success of its overlay deployment program, the CP Tech Center is adopting a similar approach for helping agencies deploy other major concrete paving innovations.

For more information contact Dale Harrington, Snyder & Associates, Inc., CP Tech Center outreach coordinator, dharrington@snyder-associates.com

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