New traffic signal design developed at InTrans reduces wind-induced vibration, and costs

Project led by BEC Researcher Alipour now in implementation phase

A recently funded project led by Bridge Engineering Center (BEC) Researcher Alice Alipour will be implementing a recently developed traffic light signal that has proven to effectively mitigate vibration in traffic signal structures.

The modified traffic light design increases aerodynamic damping and reduces vibration of the traffic signal structure. The proof-of-concept was developed as part of the National Cooperative Highway Research Program (NCHRP) Innovations Deserving Exploratory Analysis (IDEA) program that explores the feasibility of unproven technical concepts. Now, as part of a follow-up NCHRP IDEA project, Alipour will test and try the developed idea on a full-size traffic signal structure.

"In the initial project, we introduced the first known effort to use the geometric characteristics of the signal light itself to mitigate the problem," said Alipour, who is also an associate professor at Iowa State University. "In the recently funded follow up project, we get to expand the concept from the laboratory to a real-world environment by implementing it on a real-life structure."

“The economic implications of this approach are huge considering the millions of these structures that are being maintained by cities and state DOTs,” said Alipour. “This new strategy can be used as a mitigation technique for the existing structures, and by implementing it for new structures, it can help with savings on the structural system.”

Learn more about the project at: https://intrans.iastate.edu/research/completed/development-of-a-novel-aerodynamic-solution-to-mitigate-large-vibrations-in-traffic-signal-structures/
From the Director: Artificial intelligence (AI) – enough already!!!

Column disclaimer: I certify that the content below has been created by my limited individual brain structure and life experience. While I interact with AI every day and could have used it in part or in full to “create” this column, the words and errors are truly my own (if not referenced) with the assistance of my editor and friend. Thank you, CC.

I’m guessing, unless you’ve been hiding somewhere, that you’ve been pulled into, whether voluntarily or simply because we are all “connected,” the media tornado that is the discussion around AI. I put the word “connected” in quotes here, because my personal definition of this word is not based on technological capabilities. But, that is not the subject of this column, and I’ll set that aside as the type of meaningful discussion that should occur—perhaps, my friends—when we are together and can share our thoughts and firing mirror neurons with respectful agreement or disagreement.

As many of you know by this time, I tend to float within two different communities on a regular basis: the informational analytic and the heart- and nature-inspired creative. These worlds are not as far apart as they might seem and are often impossible to separate. AI—these “devices” or “programs” that now appear to search out information, “create,” improve (dare I say “learn”), and “create” again—is one subject of commonality. A subject area about which I’ve even heard the creators admit (dare I say “learn”), and “create” again—is the discussion around AI. I put the word “connected” in quotes here, because my personal definition of this word is not based on technological capabilities. But, that is not the subject of this column, and I’ll set that aside as the type of meaningful discussion that should occur—perhaps, my friends—when we are together and can share our thoughts and firing mirror neurons with respectful agreement or disagreement.

About LTAP

LTAP is a national program of the FHWA Iowa LTAP, which produces Technology News, is financed by the FHWA and the IOWA DOT and administered by the Institute for Transportation at Iowa State University:

Institute for Transportation
ISU Research Park
2711 S. Loop Drive, Suite 4700
Ames, Iowa 50011-8664
Telephone: 515-294-8103
Fax: 515-294-0467
intrans.iastate.edu

Disclaimers

Any reference to a commercial organization or product in this newsletter is intended for informational purposes only and not as an endorsement. The opinions, findings, or recommendations expressed herein do not necessarily reflect the views of LTAP sponsors. All materials herein are provided for general information, and neither LTAP nor its sponsors represent that these materials are adequate for the purposes of the user without appropriate expert advice.

Iowa State University makes no representations or warranties, expressed or implied, as to the accuracy of any information herein and disclaims liability for any inaccuracies.

Nondiscrimination

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a US veteran. Inquiries regarding nondiscrimination policies may be directed to the Office of Equal Opportunity, 3410 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, telephone: 515-294-7612, hotline: 515-294-1222, email: eooffice@iastate.edu.

Subscriptions to Technology News

Subscriptions to Technology News are free. Subscribe online (iowaltap.iastate.edu/subscribe-to-technology-news/) or by contacting the editor (see page 4). To obtain permission to reprint articles, contact the editor (see page 4). Readers’ comments and article topic suggestions are welcome.

Keith
LTAP offers resources to navigate infrastructure law

In little more than a year after President Joe Biden signed the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), more than 20,000 projects across the US have already been awarded funding. The projects include more than $2 billion in projects awarded in Iowa.

However, those projects and funds are just a drop in the bucket of the $550 billion that will be allocated in the US through 2026. Half of those new federal funds will go toward transportation.

Finding the available funding opportunities and navigating the grant application process may be difficult for agencies with limited resources and time.

To help local agencies with their efforts, the Iowa LTAP has developed a one-stop web page that aims to collect current and impending funding announcements, resources for submitting grant applications, and general background details about the law.

The web page can be found at https://iowaltap.iastate.edu/iija-bil-resources/, or under the Resources tab at the Iowa LTAP website.

The page is being updated regularly to keep up with the most current information and provide new resources as they become available. However, please reach out if there's more information or specific resources we can provide.

Low Volume Roads Conference: Register today for July 23–26 event

Registration also open for supplementary events

The 13th TRB International Conference on Low Volume Roads is a “once or twice in a lifetime” event that is fast approaching. Registration is open for this special opportunity for Iowa professionals.

The event will be held July 23–26, 2023, in Cedar Rapids. The conference is convened by the TRB and is a global forum to examine new technologies and new techniques in planning, design, construction, operation, maintenance, and administration of low volume roads.

Registration information and a preliminary agenda are available here: https://trb.secure-platform.com/a/page/lowvolumeroads. Early-bird rates have ended, but prices will increase again after June 23.

Low Volume Road Conference attendees are also invited to the Iowa Night on the evening of July 24. The event is hosted by the ICEA and is expected to be a great evening of good old Iowa friendliness, food, and fun. It is provided at no additional cost, and transportation will be provided, but is limited to those who are registered for the conference.

There is also a bridge site bus tour and workshop that will be held on July 27 provided by Buchanan County and the Short Span Steel Bridge Alliance.

More details and separate registrations are available for both the Iowa Night and bridge site tour/workshop events, which are not sponsored by TRB but do not conflict with other conference agenda items, at the above link under “Offsite Events.”

The Low Volume Road Conference has been held every four years since 1975 and was last held in Cedar Rapids in 1979, for the 2nd International Low Volume Roads Conference. The event typically draws between 200 and 300 practitioners and researchers from more than 20 countries.
Iowa LTAP Mission
To foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

Staff
Keith Knapp
Director of Iowa LTAP
kknapp@iastate.edu

Paul Albrighton
Technical Training Coordinator
palbright@iastate.edu

Kori Mahieu
Education & Activity Administrator
korim@iastate.edu

Christinia Crippes
Technology News Editor
ccrippes@iastate.edu

Theresa Litteral
Statewide MDST Facilitator
litteral@iastate.edu

David Veneziano
Safety Circuit Rider
dvenez@iastate.edu

Advisory Board
Tyler Christian
Marion County Engineer
641-828-2225
tchristian@co.marion.ia.us

BEC concludes two FHWA projects
BEC researchers recently wrapped up two projects sponsored by the FHWA to support its Office of Infrastructure program.

The Guide for Orthotropic Steel Deck (OSD) Level 1 Design and Advancing Bridge Load Rating: State of Practice and Frameworks both concluded in December and are part of the Infrastructure Research and Technology Deployment Program.

Though the projects do not set national standards for their respective topics, they both aim to further standardize and simplify the processes in their respective areas.

“OSDs are durable, redundant, and lightweight, making them a popular option for both new design and the rehabilitation of signature structures. However, the complexity of design, sophisticated analysis requirements, large fabrication costs, and the possibility of owner-mandated experimental testing generally makes OSDs prohibitive for use with commonplace bridges,” said BEC Acting Director Justin Dahlberg, who served as principal investigator (PI) on the OSD guide project.

Dahlberg added that the intention of the guide is to further develop details of Level 1 design—using proven OSD solutions without the need for analysis—and to encourage the implementation of OSD systems.

Similarly, the bridge load rating project helps address the need for improved processes and consistency in standards via the identification and development of state of practice and future frameworks.

“Due to the vast bridge inventory in the US, establishing an efficient framework for the load rating, posting, and overweight permitting of bridges may be of great benefit to state agencies by providing consistency and by helping to optimize technological advancement capabilities,” said Bridge Research Engineer Brent Phares, who served as PI on the bridge load rating project.

Phares added that the technological advances should improve the efficiency of decision-making while taking advantage of better load rating tools, which could also improve management of rehabilitation and replacement budgets.

Learn more about the OSD guide at: https://intrans.iastate.edu/research/completed/guide-for-orthotropic-steel-deck-level-1-design/, and learn more about the advancing bridge load rating project at: https://intrans.iastate.edu/research/completed/advancing-bridge-load-rating-best-practices-and-model-frameworks/.

A long-span orthotropic bridge, the Poplar Street Bridge over the Mississippi River
Safety performance functions offer new insights into intersection crashes

It takes a significant effort to develop a new scientific method to predict the safety performance of roadways. The task of implementing the novel approach to understanding intersection crashes is no less vast.

The research developed at InTrans under its Center for Transportation Research and Education (CTRE) led by researchers Zachary Hans and Hossein Naraghi is now being implemented at the Iowa DOT and led by Naraghi.

“It takes a lot of effort to change the thought process of safety practitioners to convince them of the robustness of the new method and be able to answer tons of questions they have about the new approach,” said Naraghi, who had the unique experience of being on both sides of research development and implementation.

He added, “All in all, I think my experience of being involved in development side tremendously helped me to break the huge road blocks on the implementation side.”

What is the research?

The CTRE project first developed an intersection database—identifying all intersections in the state—and then the intersections were assigned to categories based on similar traffic control, cross section, speed limits, and traffic volumes. From there, project members determined the number of crashes at the intersections using five years’ worth of data.

Finally, they developed and refined the safety performance functions (SPFs), or models, to account for the randomness of crashes and to determine the difference between the actual crash experience and what number of crashes would be expected at similarly defined intersections and roadway segments.

An SPF is an equation used to predict the average number of crashes per year at a location as a function of exposure and, in some cases, roadway or intersection characteristics. The SPFs were developed for 11 categories of paved intersections (defined as having at least one paved approach) and for 8 categories of primary road segments. The models were also developed for all crashes and severe crash categories.

“There’s a lot can we can learn from having a better understanding of how a location is actually performing compared to how we’d expect it to perform, based on these models,” said Hans, who was the principal investigator on the SPFs research project and is a research engineer with CTRE. “Additionally, the network may be screened for possible opportunities for improvement.”

The sites where the observed number of crashes, corrected for randomness, is higher than predicted crashes offer a potential for crash reduction and thus may warrant additional study to determine whether there are countermeasures that can be implemented to improve the safety at those locations.

How is the research being implemented?

Naraghi, who now works as a safety data analyst at the Iowa DOT, said each of the crash sites are ranked with high, medium, and negligible potential for crash reduction, and the ranking tiers are utilized by the Iowa DOT and other transportation agencies to identify and prioritize their safety projects.

“The SPFs are an integral part of road safety management activities and enable safety practitioners at the DOT and other agencies to utilize the models’ results to allocate the limited resources to the sites with highest potential for crash reduction,” said Naraghi.


“There’s a lot can we can learn from having a better understanding of how a location is actually performing compared to how we’d expect it to perform, based on these models.”

—Zachary Hans, principal investigator on SPFs research project
In brief: Lasting LTAP impacts

The Iowa LTAP continues to expand its Equipment Loan Program. Two cellular signal boosters have been added to the collection of items available for free loans.

Purchased by the Iowa DOT for use in e-ticketing efforts by cities and counties, these devices strengthen cellular signals in locations where signal strength may be weak. Iowa LTAP is facilitating the free loan of these two units to local agencies.

The Iowa DOT implemented its new e-ticketing system in 2020. E-ticketing is an electronic means of producing individual scale tickets and providing material haul summaries for construction companies. The system helps ensure employees are safe at the jobsite. Instead of having a traditional ticket taker—whether it’s the “dump man” or field tester/inspector—in the way and often not in view of the truck driver, e-ticketing allows users to (electronically and safely) view tickets, capture proof of delivery, and add test results directly from their mobile device (such as a cell phone or tablet).

Ultimately, the cellular signal boosters enhance cellular signal strength, quality, and data transfer speeds, thus allowing users to access the Iowa DOT’s system in locations where a mobile device may not necessarily have a reliable connection. The unit is easy to use. Just press the power button and connect to the booster via Wi-Fi while at the jobsite.

“The continued use of the different equipment available through the LTAP loan program has assisted local agencies in Iowa to improve the safety of their roadways, alongside the safety of their employees,” said David Veneziano, LTAP Safety Circuit Rider. “We understand the value of access in the field, which is why we are pleased to be able to provide that with these new booster units for our local agencies for use on their projects.”

If interested, fill out the form here to request the equipment: https://iowaltap.iastate.edu/cell-booster/. As always, the entire collection is available to loan, free-of-charge. Check out all the currently available equipment available here: https://iowaltap.iastate.edu/equipment-loan-program/, and don’t forget to share your impact story with us!

Article written by Brandy Haenlein, a communication specialist with InTrans.

Iowa LTAP now accepting applications for Mousetrap contest

Competition deadline is May 5

It is the people on the front lines who often discover the latest and best practices, whether through new gadgets that improve the quality and safety of a project or innovative processes that reduce costs and improve efficiency.

Each year, Iowa LTAP sponsors a statewide Build a Better Mousetrap (BABM) Competition that provides a great opportunity for local agencies to share their new ideas with others.

We are looking for submissions from Iowa’s local public agencies (e.g., cities and counties) that have created new solutions to problems or found ways to work more effectively. The top three winners are recognized statewide and are offered free workshop registrations.

BABM competition continued on page 7
Workshop and conference calendar

[Information current as of March 20, 2023] Iowa LTAP will continue holding both virtual and in-person events and trainings throughout the spring and summer.

For the most up-to-date information about in-person attendance requirements and additional upcoming virtual events, please check regularly at https://iowaltap.iastate.edu/events/ and consider subscribing to our mail list at https://iowaltap.iastate.edu/ for email updates.

<table>
<thead>
<tr>
<th>2023</th>
<th>Event Name</th>
<th>Location</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Excavation Safety Workshops</td>
<td>Storm Lake</td>
<td>Paul Albritton</td>
</tr>
<tr>
<td>5</td>
<td>Excavation Safety Workshops</td>
<td>Clarion</td>
<td>Paul Albritton</td>
</tr>
<tr>
<td>6</td>
<td>Excavation Safety Workshops</td>
<td>Independence</td>
<td>Paul Albritton</td>
</tr>
<tr>
<td>6</td>
<td>Accessible Sidewalks and Curb Ramps: Design to Installation</td>
<td>Ames</td>
<td>Keith Knapp</td>
</tr>
<tr>
<td>11</td>
<td>Excavation Safety Workshops</td>
<td>Corning</td>
<td>Paul Albritton</td>
</tr>
<tr>
<td>12</td>
<td>Excavation Safety Workshops</td>
<td>Indianola</td>
<td>Paul Albritton</td>
</tr>
<tr>
<td>13</td>
<td>Excavation Safety Workshops</td>
<td>Sigourney</td>
<td>Paul Albritton</td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>County Engineers Research Focus Group</td>
<td>Ames</td>
<td>Keith Knapp</td>
</tr>
<tr>
<td>9</td>
<td>MUTCD Signing Review</td>
<td>Ames</td>
<td>David Veneziano</td>
</tr>
<tr>
<td>10</td>
<td>MUTCD Signing Review</td>
<td>Atlantic</td>
<td>David Veneziano</td>
</tr>
<tr>
<td>11</td>
<td>MUTCD Signing Review</td>
<td>Cherokee</td>
<td>David Veneziano</td>
</tr>
<tr>
<td>16</td>
<td>MUTCD Signing Review</td>
<td>Cedar Rapids</td>
<td>David Veneziano</td>
</tr>
<tr>
<td>17</td>
<td>MUTCD Signing Review</td>
<td>Waverly</td>
<td>David Veneziano</td>
</tr>
<tr>
<td>18</td>
<td>MUTCD Signing Review</td>
<td>Fairfield</td>
<td>David Veneziano</td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23–26</td>
<td>TRB Low Volume Roads (LVR) Conference</td>
<td>Cedar Rapids</td>
<td>Keith Knapp</td>
</tr>
<tr>
<td>24</td>
<td>Iowa Night at TRB LVR Conference</td>
<td>Atkins</td>
<td>Keith Knapp</td>
</tr>
</tbody>
</table>

Contact information

Paul Albritton, 515-294-1231, palbritt@iastate.edu
Keith Knapp, 515-294-8817, kknapp@iastate.edu
David Veneziano, 515-294-5480, dvenez@iastate.edu

Event details and online registration

Watch for details and online registration information, by specific dates and events, on the Iowa LTAP Workshops page, iowaltap.iastate.edu/workshops/.

BABM competition continued from page 6

Local agency employees can learn more about the competition and submit an entry at https://iowaltap.iastate.edu/iowa-babm-competition/. The deadline to submit an innovation is May 5, 2023.

Entrants must provide a photo of their invention, details on its cost and savings/benefits to the community, and offer background as to why and how the solution was developed. Videos of the equipment or innovation are strongly encouraged. The entries will be judged on cost savings/benefits to the community, ingenuity, ease of transferability, effectiveness, and video demonstrations.

Madison County won the 2022 Iowa competition for its inventive shop clean-up squeegee.

More details about previous Iowa winners are available here: https://iowaltap.iastate.edu/iowa-innovations/.
LTAP Materials

✓ Order library materials
✓ Add a name to our mail list
✓ Correct your mailing information

To make a change to the Technology News mail list or to order library materials, please complete the information below and mail or fax this page (including mail label) to the InTrans address below:

Institute for Transportation
2711 S. Loop Drive, Suite 4700
Ames, IA 50010-8664
Fax: 515.294.0467

☐ Add the name/address below to the Technology News mail list.
☐ Delete the name/address below from the Technology News mail list.
☐ Correct the name and/or address below on the Technology News mail list.

New or corrected mailing information:
Name ______________________________________________________
Title ______________________________________________________
Organization _______________________________________________
Address ___________________________________________________
City ________________________________ State __________ Zip __________

☐ Send the following library materials to the address above:
Title: ______________________________________________________
P., V., DVD or CR-number: _________________________________
Title: ______________________________________________________
P., V., DVD or CR-number: _________________________________

Subscribe to Technology News online at
iowaltap.iastate.edu/subscribe-to-technology-news/