



# FY2020

# RESEARCH AT-A-GLANCE

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# LEADING THE WAY

**From its inception**, the Iowa Department of Transportation has been a leader in transportation research. Beginning with the Iowa Highway Research Board in 1949, Iowa DOT has stayed on the leading edge of innovations in materials, processes, and technologies that have brought improvement and longevity to transportation systems around the world.

**Our Mission:** Driving a quality research program that delivers targeted solutions for Iowa's transportation future.



## FOCUS AREAS | We organize our research efforts around four focus areas:



### SAFETY

Reducing transportation fatalities and serious injuries through system-wide, multimodal, data-driven, and proactive strategies.



### MOBILITY

Improving the accessibility, reliability, time, and costs associated with the movement of people and goods.



### SUSTAINABILITY

Considering how transportation supports economic, social, and environmental progress with a long-term perspective.



### TECHNOLOGY

Evaluating both current and potential technologies and incorporating them effectively into existing agency functions.

## SUPPORTING IOWA DOT'S RESEARCH PROGRAM

Iowa's transportation innovations are possible with oversight and technical and financial support from a variety of sources:

**IOWA HIGHWAY RESEARCH BOARD (IHRB).** This advisory group is responsible for assisting Iowa's cities and counties and Iowa DOT in the development and continuation of an effective program of research and progress in highway transportation. Funding for IHRB comes from Iowa's Road Use Tax Fund for research.

**STATE PLANNING & RESEARCH (SPR) PROGRAM.** Funding from this Federal Highway Administration (FHWA) program supports statewide planning and research activities at state DOTs. SPR funds are also used for participation in the [Transportation Pooled Fund Program](#).

**STATE TRANSPORTATION INNOVATION COUNCIL (STIC).** Another FHWA-supported program, the STIC network offers technical assistance and funds to support the costs of standardizing innovative practices in state transportation agencies. STIC members come from federal, state, and local agencies; industry; and academia. IHRB serves as the STIC for Iowa DOT.

# ENGAGING & COLLABORATING WITH IOWA DOT RESEARCH

Iowa DOT Research strives to deliver top-quality, targeted solutions for Iowa's transportation future. Whether you're looking to get involved in our research, already have an approved project in the works, or simply want to learn more about our team, we can help.



GET INVOLVED

- **Submit an Idea.** Research ideas can be submitted by anyone (within or beyond the department) at any time through our [Research Ideas website](#).
- **Provide Input.** While ideas are in the open feedback stage, anyone can provide written comments or vote on new proposed ideas.



WORKING WITH US

- **Respond to a Proposal.** Requests for proposals (RFPs) are posted to the [Open Requests for Proposal web page](#) three times per year. Sign up to receive email notices of new RFP postings on our [News and Subscriptions](#) page.
- **Discover Our Process.** Once a proposal is approved for funding, the work can begin! Learn more about the [steps the research team goes through](#), from contract to final report.



LEARN MORE

- **Follow the Money.** Our research projects are funded through [three primary programs](#). Find out more about them and how they each contribute to Iowa DOT's position as a national leader in innovative research.
- **Meet Our Partners.** Iowa DOT works with a variety of [institutions and external agencies](#) to achieve our goals.

## PROGRAM OUTREACH

Workshops and peer exchanges are an efficient and cost-effective way for transportation professionals to discuss their programs and best practices. Iowa DOT is frequently invited to participate as a model research program. Here are a few examples of our outreach in Fiscal Year 2020 (FY2020):

**Virtual Peer Exchange: Structural Approaches to Innovation Programs & STIC, June 2020** – This two-day event hosted by Utah DOT brought together 10 state DOTs to better understand how to foster a culture of innovation and leverage State Transportation Innovation Council resources.

**Research Management and Innovative Mobility Technology Peer Exchange, March 2020** – Looking to reinvigorate its own research program, Colorado DOT sought to gain insight directly from Iowa DOT on its robust program in this dual-topic peer exchange.

**Mid-Continent Transportation Research Symposium, August 2019** – Hosted every two years by Iowa DOT and other partners, this event draws an average attendance of 350 transportation researchers and professionals from the Midwest and beyond with a focus on advancements and future research.

## University Collaboration

Through formal collaboration agreements with Iowa university partners, Iowa DOT is able to conduct state-of-the-art research and testing to discover new products and materials that will benefit all Iowans.



**Iowa State University**  
since 1997



**The University of Iowa**  
since 2003



**University of Northern Iowa**  
since 2007

Iowa DOT also partners with other universities and private sector firms on the state, national, and international levels.



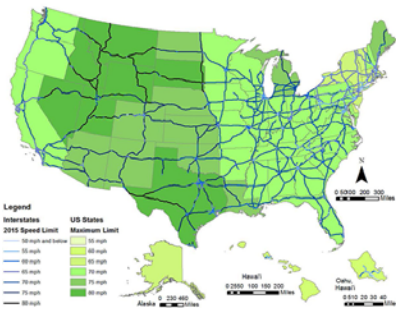
# FOCUSING ON IOWA DOT RESEARCH

Research projects highlighted below and on the following page are a sampling of the nearly 200 research projects that are in process or recently completed grouped by the four focus areas.

## SAFETY

### Design and Detailing Requirements for Columns Under Collision

This project will update Iowa DOT's current specifications for the design of a bridge pier system under expected truck collision loads to reflect recent updates to the AASHTO LRFD Bridge Design Specifications. Researchers will also introduce new specifications for a three-column frame pier that could be used as a standard design under collision. [IHRB Project TR-768](#)



### Evaluation of Speed Limit Policy Impacts on Iowa Highways

Iowa DOT investigated the relationship between speed limits and fatality rates in response to the Iowa Legislature's recent discussion about increasing the maximum speed along Iowa's rural interstates. (The 70 mph maximum speed limit on Iowa's rural interstates went into effect in 2005.) Researchers examined how traffic fatality rates have changed over time, focusing on changes resulting from recent speed limit increases made by other states to 75 mph and above. [SPR Project 17-SPR0-012](#)

## MOBILITY

### Real-Time Flood Forecasting and Monitoring System for Highway Overtopping in Iowa

The processes and technology developed to alert the public to bridge flooding may be applied to at-risk highways as well. By monitoring the 26 most vulnerable sites, Iowa DOT will work to develop a warning system that can mobilize maintenance staff before roadways become dangerous. [IHRB Project TR-699](#)



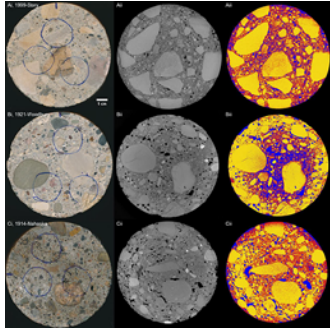
### Implementation of a Structural Health Monitoring System

Iowa DOT's structural health monitoring (SHM) system detects changes in a bridge's performance due to damage or deterioration, and it can also be used to determine load ratings and the bridge's remaining service life. More than 15 Iowa bridges are currently monitored using the successful SHM system. [SPR Project RB19-016](#)

# SUSTAINABILITY

## Utilization of Ground Tire Rubber for Energy Efficient Pavements

Researchers are examining ways to integrate scrap and end-of-life rubbers to replace up to 140,000 tons of virgin polymer used each year in asphalt pavements. Under consideration is a method to modify ground tire rubber particles from recycled tires and use them as an asphalt modifier to replace widely used polystyrene-butadiene-styrene elastomers. [IHRB Project TR-787](#)



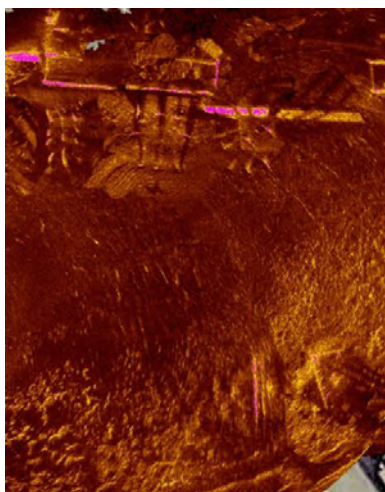
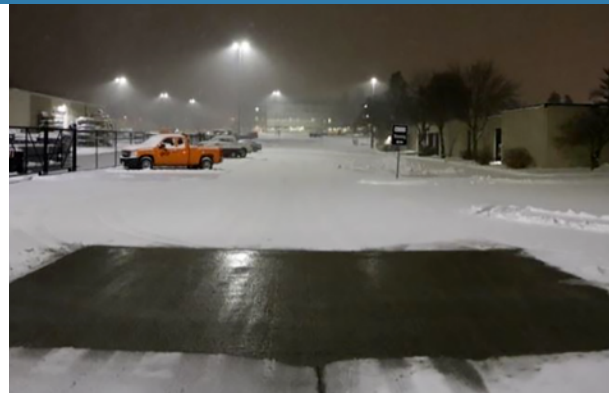
## Analysis of Ancient Concretes

The methods for making concrete pavements have changed over the years, but some pavements poured before 1950 are still in great shape. Investigators sought to discover why and determine what can be done to help new concrete last longer. Results suggest that, in Iowa, pavement age can be used as a strong predictor of portland cement concrete porosity. [SPR Project 18-SPR0-008](#)

# TECHNOLOGY

## Implementing Self-Heated Concrete System in Iowa City

Heated concrete (also called electrically conductive concrete) provides a low-cost and environmentally friendly option for clearing snow-covered roadways and other pavements without the use of chemical deicers. In this study, investigators will install and monitor self-heating concrete at a pedestrian crossing and bus stop test site, and develop technical specifications for implementation at future sites. [IHRB Project TR-789](#)



## Acoustic Imaging System

Routine bridge inspections are critical to ensuring user safety, but the portions of the bridge that are underwater can be difficult to inspect visually. High-resolution scanning sonar equipment offers a promising solution, creating imagery that allows inspectors to “see” beneath the surface and identify areas of concern without jeopardizing divers’ safety in murky or debris-filled water. [SPR Project RB24-014](#)

**Get Involved!** Iowa DOT staff and partners from local public agencies and industry can be part of the research process by becoming a member of a research group or committee, [submitting an idea](#), or providing feedback on other ideas. Staff can also represent Iowa at the national level by serving on research and technical committees convened by the [Transportation Research Board](#) and [AASHTO](#).

# LEVERAGING FUNDING WITH PARTNERSHIPS

## Transportation Pooled Fund Program

By joining forces, two or more DOTs with a shared research goal can get all the benefits of the research results at a fraction of what it would cost individually. Iowa DOT is a nationally recognized leader in transportation research, participating in 60 active **Transportation Pooled Fund (TPF)** studies and serving as the lead agency for 20 of these. Project results help Iowa DOT make better-informed decisions, conserve resources, and remain on the cutting edge of technological advancements.

### Getting the Most From Our Research Dollars

Without participating in pooled funds, it would take Iowa DOT **67 years** to independently fund the same amount of research.

### TPF-5(219): Development of a Structural Health Monitoring System to Evaluate Structural Capacity

Mile for mile, bridges are a transportation agency's most expensive asset. This **pooled fund project** developed tools and systems to help DOTs manage bridge maintenance investments:

- An automated system detects bridge damage and estimates bridge load ratings.
- Models develop predictions for future bridge condition ratings.

### TPF-5(295): Smart Work Zone Deployment Initiative (SWZDI)

Launched in 1999 and currently led by Iowa DOT, the SWZDI pooled fund has produced more than 100 studies, evaluations, and syntheses addressing safety and mobility in highway work zones.



One of SWZDI's newest products is the **Smart Work Zone Activity app (SWiZAPP)**, a cross-platform app that disseminates information in real time for an unlimited number of construction work zones.

Thanks to this app, Iowans now have more timely and accurate information about work zones and can make better-informed decisions regarding their travel and safety.

### TPF-5(290): Aurora Program: Optimal RWIS Sensor Density and Location, Phase II



A road weather information system (RWIS) network uses a range of technologies to collect, process, and disseminate road weather and condition information. This **Aurora project** developed a method to determine the optimal density and location for RWIS components to ensure the network provides adequate monitoring coverage.

## IOWA HIGHWAY RESEARCH BOARD

A leader in transportation research for over 70 years

Since its creation in 1949, the **Iowa Highway Research Board (IHRB)** has been the backbone of Iowa's transportation research program, providing a progressive, continuing, and coordinated program of research and development that directly benefits Iowans across the state. As the first organization of its kind in the U.S. to investigate road construction problems at the local level, IHRB's work over the past 70 years has helped to make Iowa a leader in the discovery of innovative transportation-related solutions.

The IHRB consists of 15 regular members and represents a variety of stakeholders. It has seven Iowa county engineers,

four Iowa DOT engineers, one representative from Iowa State University, one from the University of Iowa, and two engineers employed by Iowa municipalities. This group oversees approximately 20 research projects each year, and nearly 800 projects since the IHRB was established.

The IHRB is serious about the future of transportation. Understanding that every research project has the potential to strengthen the infrastructure and save lives, time, and precious resources, the members of the board work hard to make sure new methods, technologies, and materials are developed efficiently and economically for application in the real world.

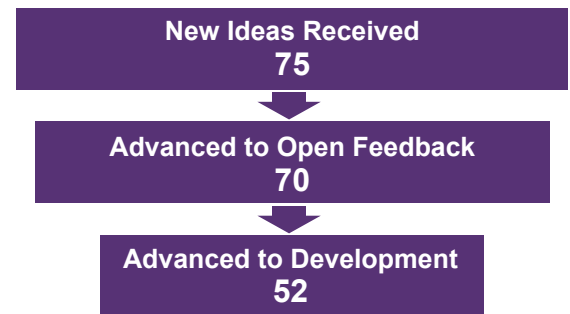


# IOWA DOT'S RESEARCH PROGRAM BY THE NUMBERS

## Research Idea Submissions

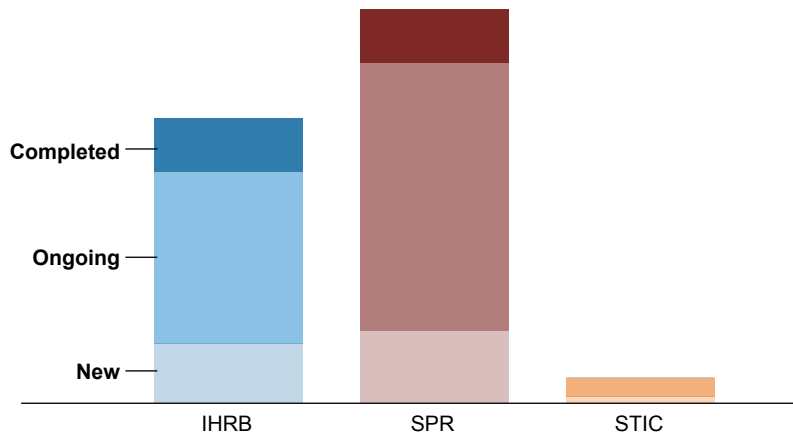
Research ideas can be submitted by anyone at any time through the [Research Ideas website](#). While ideas are in the open feedback stage, anyone can provide written comments or vote on a new idea.

Almost all FY2020 research ideas progressed to the open feedback stage; more than two-thirds advanced to development.



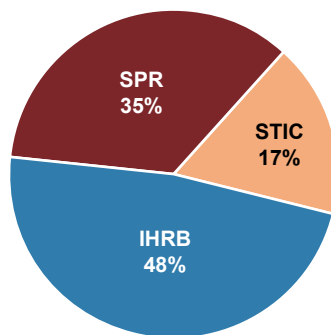
## Research Program Activity

Iowa DOT Research staff oversaw 225 projects in FY2020.



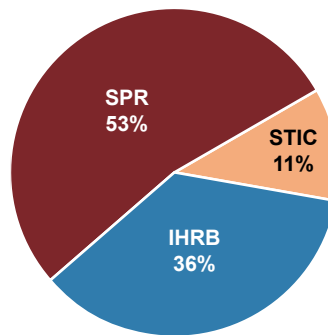
Project Type	IHRB	SPR	STIC	Total
New	19	23	2	44
Ongoing	55	86	6	147
Completed	17	17	0	34

## FY2020 FUNDING BY PROGRAM: New FY2020 Funding



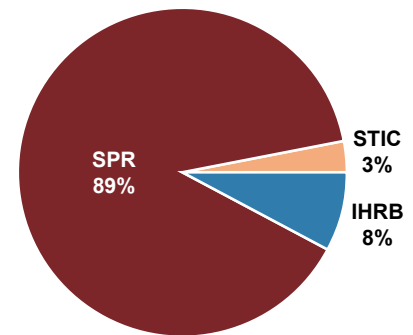
IHRB	\$3,040,905.76
SPR	\$2,188,277.00
STIC	\$1,094,446.70
<b>Total</b>	<b>\$6,323,629.46</b>

## FY2020 FUNDING BY PROGRAM: Iowa DOT Funding for All Ongoing Projects



IHRB	\$11,532,899.00
SPR	\$16,833,806.48
STIC	\$3,452,440.17
<b>Total</b>	<b>\$31,819,145.65</b>

## FY2020 FUNDING BY PROGRAM: Leveraged Funding for All Ongoing Projects



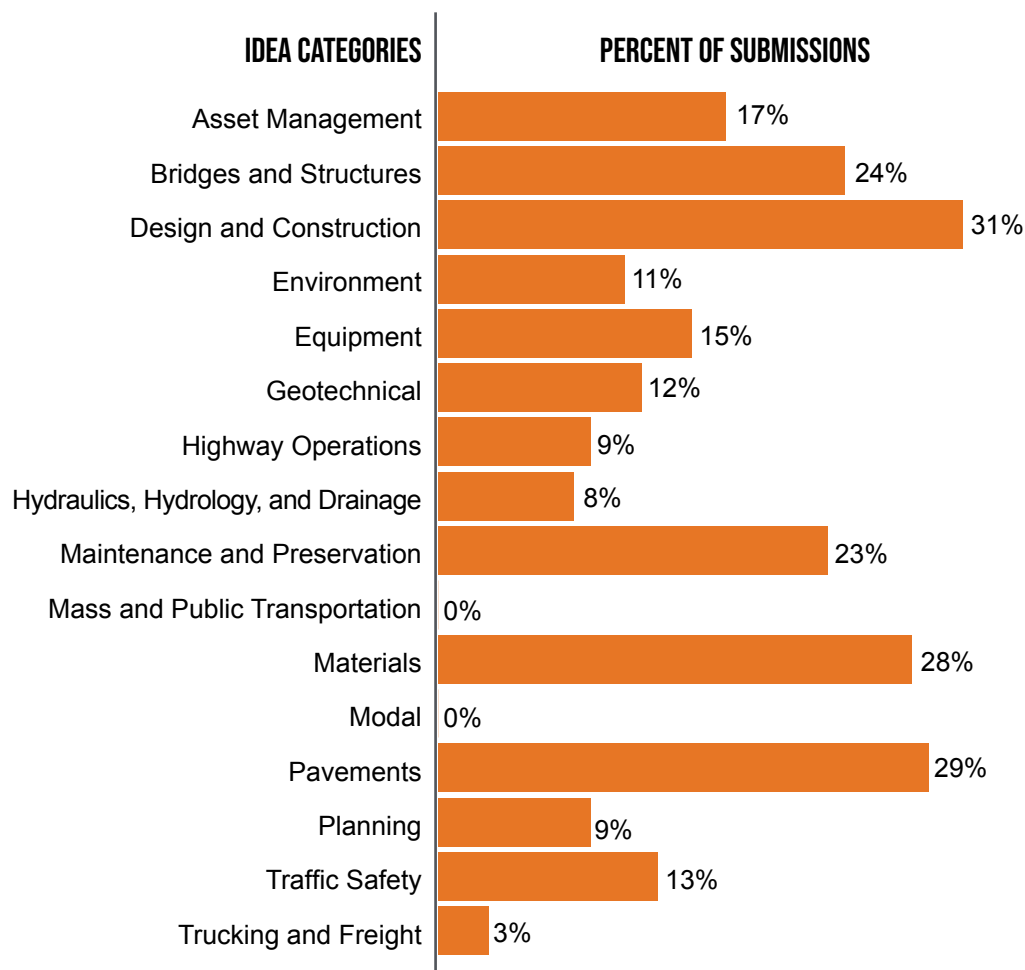
IHRB	\$13,445,817.00
SPR	\$156,131,261.48
STIC	\$5,163,990.17
<b>Total</b>	<b>\$174,741,068.65</b>



# IOWA DOT'S RESEARCH PROGRAM BY THE NUMBERS

## Categorizing Research Ideas

The categories assigned to all research ideas submitted provide an early indication of what future projects will focus on. More than one category can be assigned to an idea.



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