AASHTO
AASHTO INNOVATION INITIATIVE

AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation

1. Sponsoring DOT (State): Georgia Department of Transportation

2. Name and Title: Binh H. Bui, Research Implementation Manager

Organization: Office of Performance-based Management and Research

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State: Georgia

Zip Code: 30297

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3. Is the sponsoring State DOT willing to promote this innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative? ☒ Yes ☐ No

Innovation Description (10 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

4. Name of the innovation:

A Comprehensive Condition Evaluation System for Rigid Pavements and An Upgraded Georgia Faultmeter Devices (GFM)

5. Please describe the innovation. Describe how this innovation transforms your existing "state of play."

To address the absence of systematic and efficient monitoring of Georgia's rigid pavements' condition, GDOT has developed a comprehensive pavement condition evaluation system for both jointed plain concrete pavement (JPCP) and continuously reinforced concrete pavement (CRCP). This effort resulted in the development of a distress protocol (CRCPACES) and rating system for CRCP to standardize the identification and quantification of its six common distresses and their corresponding deduct values. Moreover, the existing JPCP distress protocol (JPCPACES) has been enhanced to include a finer distress categorization, improved faulting index calculation, and a revised rating system to accommodate the modifications.

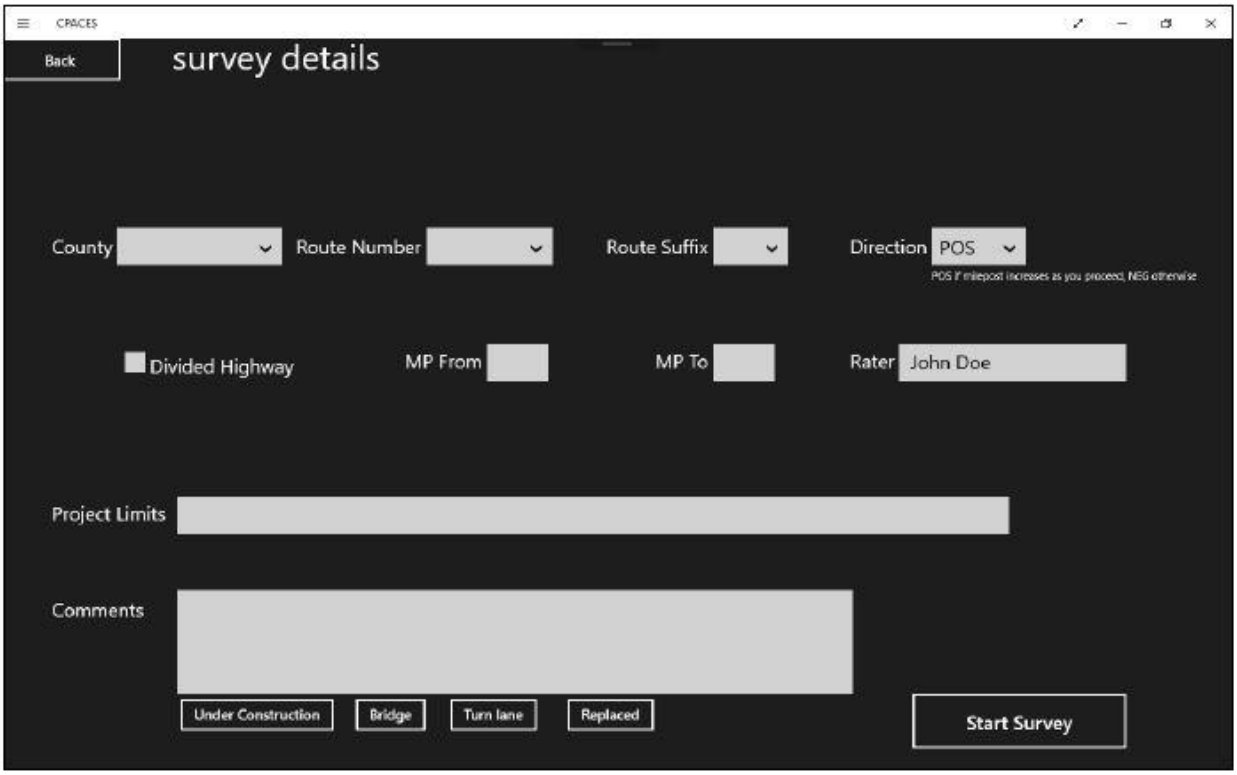
A tablet-based application was then developed for both CRCP and JPCP to eliminate the existing pen-and-paper recording method and thus improve the efficiency of the survey data collection process, ensure the data quality, and facilitate the implementation of the distress protocols. The application was developed to include tap-and-count features for easy data entry, embedded real-time data checking, and an integrated distress protocol manual.

Additionally, GDOT has upgraded its Georgia Faultmeter (GFM) devices to improve the design of the embedded electronics and its mechanics to make the new GFM more convenient to operate, more robust, and more capable of sustaining frequent routine operations. The original GFM device has been one of the most popular hand-held devices for performing faulting measurement and is used by many state highway agencies like GDOT and Minnesota DOT to conduct annual concrete faulting measurements, and by the FHWA for the Long-Term Performance Program (LTPP). Technology transfer of the original GFM device had been initiated earlier under the Strategic Highway Research Program's Accelerating Infrastructure Innovations category. It was considered by many State DOTs to be easy to use, light and compact, efficient, accurate, safer, and faster than other methods (see FHWA-SA-96-012 publication).

6. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments here. Attach photographs, diagrams, or other images here.

Data Collection Application: Homepage of CRCPACES Application

Location Information



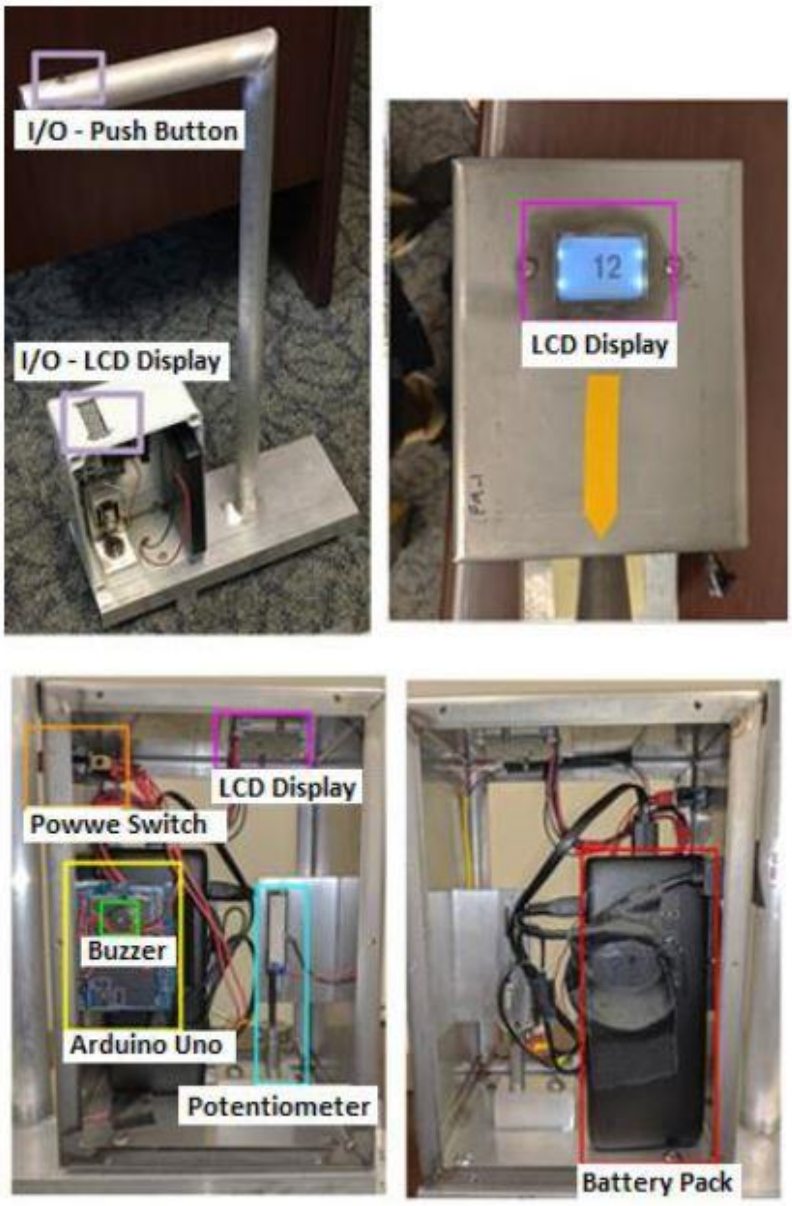
Survey details page of the CRCPACES data collection app

Survey details page of the JPCPACES data collection app

JPCPACES distress protocol integrated into the data collection app

Training: CRCPACES statewide training on November 13, 2017, in Macon, Georgia

GFM: Electronic design of the new GFM and the corresponding schematic layout



Field Faulting Measurement using GFM

7. Briefly describe the history of its development.

GDOT has been conducting annual pavement evaluation on JPCP since the 1970s when the first statewide faulting measurement was performed on interstates highways in 1971 as part of the data collection effort for a research project to study concrete pavement faulting. In the 1990s, a concrete pavement condition evaluation system (CPACES) was developed to standardize the JPCP survey in terms of distress types and severity levels, and a CPACES rating was also developed to provide an overall assessment of concrete pavement condition. However, as JPCP has continued to age and develop more distresses, the existing CPACES distress types could not differentiate the most severely distressed slabs. Thus, the aim of the enhanced protocol was to provide quality and consistent data that can better support GDOT's maintenance and rehabilitation decisions. As for CRCP, knowing that the limited amount was present prior to 2000, no standardized condition assessment survey was available. However, since 2000, GDOT has added over 400 lane miles of CRCP to its network, more than doubling the amount of CRCP in the state. This created a need for a CRCP pavement condition evaluation system including a distress protocol standardizing condition survey and a rating system quantifying the overall pavement condition.

Moreover, through the observation of the existing JPCP survey and in consultation with the office of maintenance engineers, the use of a pen-and-paper method for recording data was identified as having many drawbacks. This method would result in the data quality compromising due to human error and the additional manual data entry needed between paper and electronic format. Thus, the tablet-based application was developed for JPCP and CRCRP.

As for the GFM, it was originally designed, developed, and built by GDOT's Office of Material and Research in the 1980s, and, since then, it has been used by GDOT to measure faulting and later adopted by Long-Term Pavement Preservation (LTPP) program and many other state DOTs. Recently, the GFM was upgraded and fabricated with new electronics and mechanics.

State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

8. How ready is this innovation for implementation in an operational environment? Please check of the following options. Please describe.

☐ Prototype is fully functional and yet to be piloted

☐ Prototype demonstrated successfully in a pilot environment

☐ Technology has been deployed multiple times in an operational environment

☒ Technology is ready for full-scale adoption

After conducting several training sessions, the condition evaluation system and its corresponding tablet-based applications are already put into practice by GDOT's Office of Maintenance for its annual survey. As for the GFM, the original device has been replaced with the upgraded version that was already calibrated and validated both in the lab and the field.

9. What additional development is necessary to enable routine deployment of the innovation? What resources—such as technical specifications, training materials, and user guides—are already available to assist with the deployment effort?

As for the available resources for deployment, a new CRCPACES manual readily provides the developed protocol including the distress types, severity levels, and rating computation. Similarly, the JPCPACES manual has been updated to include all the modifications to the distresses and the rating computation. The data collection application manual is also available. As for the GFM,
Appendix B in the 'Distress Identification Manual for the LTPP' (FHWA-RD-03-031) provides a manual to operate, calibrate, and maintain the GFM.

10. Has any other organization used this innovation? ☒ Yes (for the usage of the GFM) ☐ No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
FHWA LTPP	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

MnDOT	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over other current practice (baseline).

11. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

This comprehensive rigid pavements condition evaluation system, including faulting measurements using GFM, helps the state DOT better track the performance of these assets and improve the maintenance and rehabilitation decision-making after accurately identifying their needs. Hence, as a result of an improved asset management practice, the user would ride on pavements with a better condition, especially that most rigid pavements are built on the critical road carrying heavy traffic volumes.

12. What type and scale of benefits have your DOT realized from using this innovation? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing baseline practice. Please identify the following benefit types:

Check boxes that apply	Benefit Types	Select a rating from the drop-down menu
☒	Cost Savings	4-Moderate to High
☒	Shortened Project/Service Delivery Schedule	4-Moderate to High
☐	Improved Customer Service	Choose an item.
☒	Improved Quality	4-Moderate to High
☐	Environmental Benefits	Choose an item.
☒	Organizational Efficiency	5-High
☒	Improved Safety	3-Moderate
☒	Improved Operation Performance	5-High
☐	Improved Asset Performance	Choose an item.
☐	Other (please describe)	Choose an item.

Provide an additional description, if necessary:

The developed pavement condition evaluation system helps better track the pavement performance resulting in the optimization of the funding available for maintenance and rehabilitation. Moreover, the application improves the operational efficiency of data collection, thus reducing the survey duration. As for the GFM, in addition to the previously mentioned benefits, this device provides a safer method than devices currently used for measuring JPCP faulting.

13. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?

The condition evaluation system for rigid pavements along with the developed application for data collection can be deployed in any state DOT in the US, especially for the CRCPACES since this type of pavement exists only in few states and the distress manual could help the agencies in better evaluating the condition of these pavements. GFM had been deployed in other states and its upgraded model can be easily deployed in more state DOTs in the U.S. as well as in international highway agencies managing JPCP.

Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

14. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
☒	Gaining executive leadership support	Click or tap here to enter text.
☐	Measuring performance (e.g. benefits documentation)	Click or tap here to enter text.
☐	Improving technology understanding	Click or tap here to enter text.
☐	Overcoming financial constraints	Click or tap here to enter text.
☐	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
☐	Acquiring in-house expertise	Click or tap here to enter text.

☐	Resolving conflicts with existing regulations and standards	Click or tap here to enter text.
☐	Other Challenges	Click or tap here to enter text.

15. What is the estimated cost, effort, and length of time required to deploy the innovation in another organization?

Please describe:

We plan to transfer the comprehensive condition evaluation system with its corresponding data collection application to other state DOTs by conducting training sessions on the distress protocols, JPCPACES and CRCPACES, especially for the staff performing the condition assessment, in addition to sessions on the use of the data collection application. As for the GFM, training would be conducted on how to operate, calibrate, and maintain the device for accurate faulting measurement.

Cost: 50,000

Level of Effort: High

Time: 12 months

16. To what extent should the implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

As for the data collection application, once deployed, it only requires technical support from the developers at Georgia Tech.