

RESEARCH SPOTLIGHT

Project Information

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New tool calculates the hidden costs of traffic delays during bridge work

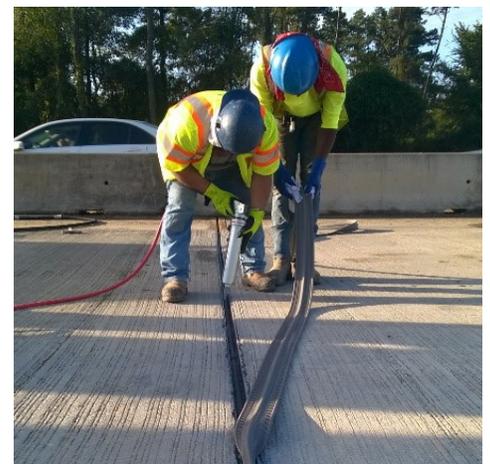
Systematically performed, bridge preservation practices can increase the time between major repairs and can lead to lower remediation costs over the life of the bridge. However, many preservation activities call for lane closures, and Michigan bridge engineers must weigh the benefits against the adverse impact on the traveling public. By calculating both life-cycle and user delay costs, the tools developed through this research will help bridge engineers compare preservation, rehabilitation and reconstruction options and ultimately make better-informed decisions.

PROBLEM

Bridge engineers must evaluate a variety of factors when deciding how and where to spend their limited repair and rehabilitation budgets. Considerations include bridge conditions, project costs and potential traffic impacts.

It is well established that preservation techniques like sealing cracks, spot painting and deck washing can help a bridge last longer and require fewer repairs over the course of its service life. Less clear, however, is whether these regularly scheduled tasks are cost-effective. While preservation activities are generally cheaper to perform and shorter in duration than bridge rehabilitation or reconstruction projects, they require additional lane closures and user delays.

For some Michigan bridge engineers, these negative effects outweigh the benefits of preservation strategies, especially in high-traffic areas. The result is that some bridges



Preservation treatments like joint sealing and repair can extend a bridge's service life.

receive fewer preservation treatments, leading to more costly repairs and lengthy reconstruction work in the future.

While it is straightforward to quantify the costs of remediation activities for bridges, user delay costs are not as well understood. The Michigan Department of

“You wouldn’t build a house and expect it to last without periodic maintenance. The same is true for bridges. By making it easier to calculate the costs and benefits, we’re hoping to make preservation work a more viable option.”

Eric Burns, P.E.
Project Manager

Transportation (MDOT) sought to develop a methodology to compare the costs of bridge activities anticipated over the life of the structure with the estimated costs of traffic impacts and user delays.

RESEARCH

Researchers began by conducting a national survey to learn what bridge preservation, rehabilitation and reconstruction activities are performed in other states. They gathered details on the specific products and practices used, the estimated time each activity takes to complete, and the life expectancy of each treatment.

Based on these results, researchers then sent a survey to MDOT’s region bridge engineers to gauge whether the national estimates for project duration are comparable to experiences in Michigan. This query also presented a hypothetical bridge with a 75-year life cycle and asked Michigan bridge engineers to identify what activities should be performed and when.

Bridge engineers from each region responded, and their answers provided valuable insights into how bridges are managed across the state. The responses also helped researchers better understand regional preferences and priorities. This information, combined with factors such as the number of daily users who would be affected by bridge work during the duration

of a given project, helped researchers devise a calculation model to determine user delay costs.

RESULTS

Researchers found that remediation activities vary significantly across Michigan’s regions, with preservation practices being more common in areas with lower traffic. For example, bridges in the University Region typically receive joint sealing repair every five years, while in the more rural North and Superior Regions, joint sealing repair is conducted on a similar schedule, but bridges also receive deck washing every two years to prolong the time to deck replacement.

Incorporating known data such as project duration, roadway capacity, traffic volume and estimated wages of the average driver, researchers developed a formula to calculate the cost of user delays in financial terms.

The work resulted in two spreadsheet tools designed to help bridge engineers directly compare construction costs and user delay costs as they make decisions regarding remediation strategies for new or existing bridges.

The first tool addresses the costs of preservation, repair and reconstruction activities over the life of a bridge and the impacts of those activities on bridge users. Bridge engineers can explore a variety of scenarios to determine a program of activities that works best for their needs and adjust strategies as necessary to achieve a desired result.

The second tool focuses on preservation, allowing bridge engineers to compare activity costs and user delay costs of a systematic preservation plan versus a no-preservation approach for an existing bridge.

Additionally, the list of preservation practices and techniques that researchers compiled as part of the national survey offers innovative ideas that could be applied in Michigan.

IMPLEMENTATION

The two spreadsheet tools will be posted to MDOT’s website and made available to bridge engineers later in 2020. To help introduce bridge engineers to the tools, researchers hosted an instructional webinar that will also be available on the MDOT website. With these resources available, regional engineers will be able to experiment with their own data and may be able to identify more opportunities to apply preservation options to extend the life of the bridges they manage.

Research Administration

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**This final report is available
online at**

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