



DEPARTMENT OF
TRANSPORTATION

RESEARCH SERVICES & LIBRARY

TECHNICAL SUMMARY

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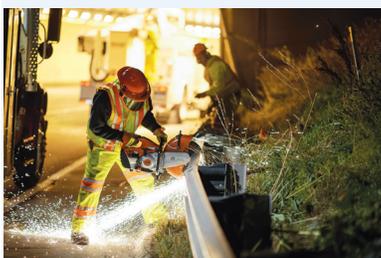
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Principal Investigator:

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PROJECT COST:

\$61,379



Funds for guardrail repairs are ultimately drawn from the same purse that pays to fill a pothole or repair a bridge deck joint.

Proposed Measure for Comparable Bridge and Pavement Condition Ratings

What Was the Need?

Pavement engineers in the MnDOT Office of Materials and Road Research use a variety of standards to measure construction and maintenance needs on Minnesota's 14,000-mile highway system. One standard used is remaining service life (RSL), an estimate of years until a road's ride quality will deteriorate to a point that requires the pavement to be replaced or rehabilitated to extend its life. Each year MnDOT surveys the surface roughness of the entire highway system and assigns an RSL to each highway segment.

The MnDOT Office of Bridges and Structures generally uses both nationally standardized assessments for deck conditions and Bridge Replacement and Improvement Management (BRIM) software to measure the condition of its 20,000 bridges. BRIM measures deterioration of bridge elements based on current and historical data and calculates probabilities for service interruption. Using deterioration curves, MnDOT determines candidates for preservation or improvement funding.

BRIM probabilities and pavement RSLs do not easily compare. MnDOT bridge engineers have been assessing an RSL for bridges, but agency planners rely more on other assessment methods. These inconsistencies between bridge and pavement groups impede strategic funding decisions that might otherwise quantitatively optimize the long-term good of the entire highway and bridge system.

What Was Our Goal?

The purpose of this study was to develop an RSL method that can be uniformly applied to both highways and bridges. In this first phase of the study, investigators examined the state of research and practice of using RSL for pavements and bridges, and recommended steps MnDOT can take toward a unified RSL system that would apply to both bridges and highways.

What Did We Do?

Researchers began with a literature review of current methods used in asset management and life-cycle cost analysis. The review of bridge research focused on performance measures and life expectancy assessment methods while the study of pavement literature concentrated on performance measures as well as RSL usage.

Next, the research team surveyed both bridge management staff and pavement management staff from state transportation agencies. Team members then analyzed the asset management practices of MnDOT's Office of Bridges and Structures and Office of Materials and Road Research to identify methods for assessing service lives and rehabilitation needs, and to highlight the similarities and differences in approaches.

Based on the findings from the survey and analysis, researchers suggested an RSL method that would serve both pavement and bridge needs, and offered guidelines for next steps in developing and implementing a unified RSL procedure.

A proposed percent remaining service interval measure could be adapted to uniformly assess the condition of bridges and pavements, enabling planners to make the most efficient use of preservation and improvement funding.

“The concept [of a uniform rating system] is simple, but getting to the payoff is challenging. There are good systems for pavements and for bridges, but they’re hard to compare.”

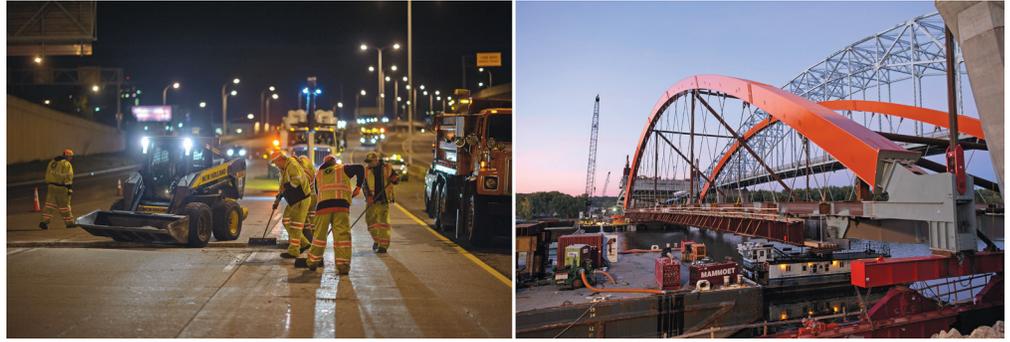
—Glenn Engstrom,
Director, MnDOT Office
of Materials and Road
Research

“Both the MnDOT Bridge office and the Materials and Road Research office have very good management systems in place compared to other agencies. There is good potential to develop a new common metric that both offices could use.”

—Mihai Marasteanu,
Professor, University of
Minnesota Department of
Civil, Environmental and
Geo-Engineering

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Planners would like a condition measure similar to RSL that could be used to compare and prioritize needs for highway and bridge construction.

What Did We Learn?

Federal Highway Administration (FHWA) research contends that RSL confuses factors and solutions for rehabilitation with those for reconstruction. A resulting emphasis on end-of-service lives drives funding toward expensive reconstructions of pavements in the worst condition, redirecting funds from rehabilitation projects that may optimize overall system durability. FHWA proposes remaining service interval (RSI) as a new measure focused on time remaining until defined treatments are needed. RSI would serve more strategic, system-focused funding decisions.

Bridge survey responses identified only two states that use RSL for bridge condition assessments; one-quarter of respondents showed an interest in using RSL for assessing asset value. Most states tie pavement funding scenarios and constraints to expected system conditions and project recommendations, but only four use RSL in pavement management.

While both MnDOT offices have very good management systems in place, they use different criteria to determine RSL. The Bridge office characterizes deck conditions with an RSL measure that does not account for preservation actions on decks and does not incorporate conditions of superstructure, substructure, expansion joints and other elements. The Office of Materials and Road Research estimates RSL based on key ride quality indices to which preservation activities contribute, and so its RSL values compare projected conditions to current conditions reasonably well.

Researchers recommended using a new measure, percent remaining service interval (PRSI), for both bridges and pavements. With PRSI, planners can target average values across systems to optimize life-cycle costs and pursue even distribution of PRSI values across systems to make planning consistent from year to year.

What’s Next?

Phase II would require working with both offices to identify relevant data for calculating PRSI for categories of pavements and bridge decks. Researchers would need to identify the time and costs required to reach the evenly distributed configuration of PRSIs necessary for planning consistency, assess how preservation activities impact funding efficiency, and calculate recommended metrics for asset sustainability and inadequate funding costs for both bridge and pavement uses.

At present, the bridge and pavement units may wish to express RSLs for their systems in terms of percentages of available service life, making RSLs functionally comparable.