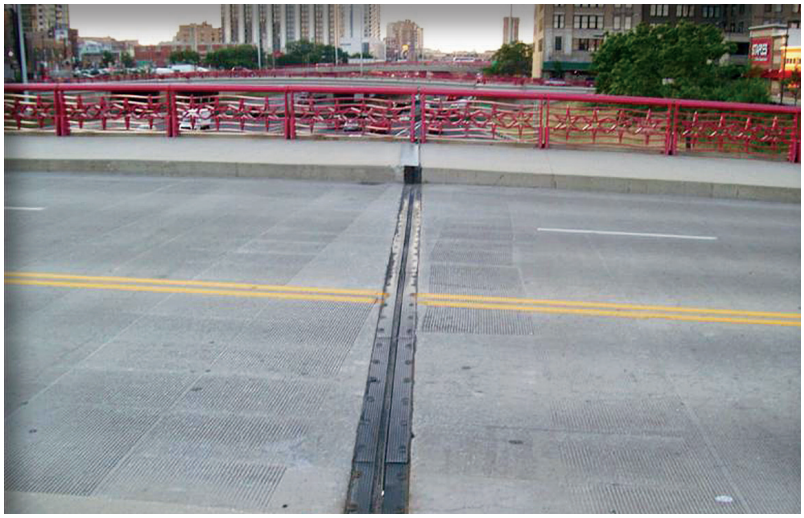
READY RESULTS
Next Steps to Put NCHRP Research into Practice

NCHRP NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

FOCUS ON: NCHRP Project 12-100

July 2017

Extending Bridge Life by Maintaining Expansion Joints



Source: Wikipedia

Expansion joints help bridges accommodate small movements caused by temperature changes. Proper maintenance keeps the joints watertight, which prevents deicers from leaking into the bridge and causing corrosion.

REAL-WORLD NEED

Small-movement expansion joints (SMEJs) are a small part of short-span bridges, but they have a big impact on the bridge's life cycle. SMEJs let the bridge accommodate movements caused by temperature changes and rotation, while also directing water and deicing chemicals off the deck and away from the bridge. However, without proper maintenance, SMEJs can develop defects that allow deicers to leak into the bridge superstructure and substructure. These chemicals can cause serious problems that are expensive to repair, such as steel girder corrosion and embankment erosion. Improper sizing of the joint seal, poor substrate preparation, and improper application have been cited as some of the reasons for expansion joint failures. To overcome these failure mechanisms, bridge owners need clear guidelines for evaluating the performance of bridge expansion joints and maintaining them.

RESEARCH SOLUTION

Investigators used a literature review, surveys of stakeholders, and the expertise of the project panel to develop SMEJ maintenance, repair, and replacement guidelines. These guidelines cover all five common SMEJ types, providing illustrated repair and installation procedures, formulas to help select and install joints, and a method to test the watertightness of joints. Agencies can use these guidelines to improve SMEJ maintenance procedures and reduce bridge damage caused by joint defects.

NEXT STEPS
Put It into Practice

REVIEW

Consult the guidelines developed through this project for guidance on small-movement expansion joint (SMEJ) installation, evaluation, and repair.

EVALUATE

Consider incorporating SMEJs into your state's existing bridge-element inspection practices.

SELECT

Use performance metrics to select replacement joint types based on a bridge's traffic levels, environmental conditions, and expected service life.

COLLABORATE

Review procedures and bridge design and inspection manuals used by other states, and share practices when appropriate.

PARTNER

Apply for NCHRP implementation funding. See trb.org/nchrp.

About the Research

RESEARCH STRATEGY

Investigators began by performing a comprehensive literature review and conducting surveys of bridge owners, bridge consultants, contractors, and SMEJ manufacturers. Using this information, the investigators determined the state of the practice in joint installation and maintenance, including the types of joints used, trends in joint usage, typical failure modes, and available maintenance guidelines. The surveys also included feedback on the effectiveness and ease of use of performance metrics for selecting replacement joints.

WHAT WE LEARNED

Strip seals are the most widely used type of SMEJ today, although asphalt plug joints, compression and bonded joints, pourable joints, and open joints are also common. Researchers compiled repair, maintenance, and replacement procedures for all five joint types. The literature review identified a life-cycle cost analysis method, but its data requirements may make it impractical for current usage. Additionally, survey respondents viewed life-cycle cost as a difficult-to-use performance measure, even if potentially valuable. Consequently, researchers proposed a flexible system for measuring performance based on joint opening, joint movement, skew, expected service life, installed cost, constructability, lead time, location, traffic, and durability.

WHY IT MATTERS

Preventing SMEJ failures will help avoid more serious damage to bridges, but doing so requires quality installation by trained crews. To help agencies maintain and replace SMEJs effectively, researchers developed a stand-alone document, *Guidelines for Maintaining Small Movement Bridge Expansion Joints*, which the AASHTO Subcommittee on Maintenance is currently reviewing for publication. In addition to illustrated repair and installation procedures, the guidelines include practices for evaluating joint condition and selecting replacement joints, formulas for calculating joint movement, a method for testing the watertightness of joints, and a simple procedure for calculating a benefit–cost ratio when comparing replacement joint options.

Step-by-step photos in the guidelines demonstrate the installation of several types of expansion joints, including this bonded joint seal.

RESOURCES

Images on this page from contractor's final report

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FINAL PRODUCTS

Guidelines for Maintaining Small Movement Bridge Expansion Joints is under review for publication by the AASHTO Subcommittee on Maintenance.

Contractor's final report
apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3651

NCHRP SENIOR PROGRAM OFFICER

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ADDITIONAL RESOURCES

Simplifying Bridge Expansion Joint Design and Maintenance, South Carolina DOT report
ntl.bts.gov/lib/46000/46200/46245/SPR_677.pdf

AASHTO Subcommittee on Maintenance, Bridges Technical Working Group
maintenance.transportation.org

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