



Bridge Maintenance Program for the City of Columbia, Missouri

tech transfer summary

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MTC RESEARCH PROJECT TITLE

Bridge Maintenance Program for the City of Columbia, Missouri

SPONSORS

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The Midwest Transportation Center (MTC) is a regional University Transportation Center (UTC). Iowa State University, through its Institute for Transportation (InTrans), is the MTC lead institution.

MTC's research focus area is State of Good Repair, a key program under the 2012 federal transportation bill, the Moving Ahead for Progress in the 21st Century Act (MAP-21). MTC research focuses on data-driven performance measures of transportation infrastructure, traffic safety, and project construction.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the project sponsors.

A well-planned program of cost-effective bridge maintenance activities can help keep bridges and culverts in good condition using limited resources and meet transportation demand.

Goal and Objective

The primary goal of this research was to extend the service lives of bridges in Columbia, Missouri. The overarching objective of the project was to develop bridge maintenance and preservation guidelines that focus on practical and implementable technologies and procedures for extending bridge service life, reducing maintenance costs, and ensuring safety and serviceability.

Background

In recent years, bridge preservation activities have become more common and have been used more frequently nationwide. Bridge preservation involves condition-based activities undertaken in response to bridge conditions (e.g., crack sealing, joint seal replacement, spot painting) or cyclical activities performed to prevent or delay damage (e.g., bridge washing, deck sealing, joint cleaning).

Bridge preservation activities prolong the useful life of bridges and forestall repairs and replacement. Maintaining a bridge in good condition can extend the bridge's service life and has proven to be cost-effective when weighed against the extensive and costly repairs resulting from bridge deterioration.



Corrosion damage caused by a leaking joint

Problem Statement

To extend bridge service life, reduce maintenance costs, and ensure safety and serviceability, a program of bridge maintenance activities must be developed that consists of a planned strategy of cost-effective treatments to existing bridges.

Research Description

The current state of the practice for bridge preservation was assessed through a literature review, consultations with contacts in the preservation community, and interviews with state-level bridge owners. The literature review focused on the common technologies used in bridge preservation activities and identified information on frequency of application, cost, and ease of application.

In addition, the current needs of the City of Columbia, Missouri were assessed, and current and historical activities performed by the city were reviewed. To help identify and prioritize preventive maintenance activities for specific bridges, an informal risk analysis was performed and a field survey of bridges was undertaken. These data were synthesized with the state of the existing practice to develop specific recommendations for the bridges in Columbia.



Debris accumulation that can cause corrosion and spalling

Recommendations for Columbia

- Identify preservation needs by implementing a bridge preservation inspection program (BPIP). This program would enhance the National Bridge Inspection Standards (NBIS) program by providing additional data on specific items relevant to preservation. The BPIP can be implemented using temporary employees to visit each bridge in the inventory and complete a simple questionnaire.
- Focus on low-cost preventive maintenance activities, identify and prioritize activities, and include a mix of short-term, mid-term, and long-term activities to prevent bridge deterioration and keep good bridges in good condition.
- Consult the maintenance notes provided in the Missouri Department of Transportation (MoDOT) biennial inspection reports for additional guidance regarding short-term, condition-based preventive maintenance activities for each bridge.
- Consult the MoDOT Engineering Policy Guide (EPG) and other resources for guidance regarding specific details and procedures for preventive maintenance activities.

Implementation Benefits

Implementing a bridge preservation program helps agencies extend the service lives of their bridges and maximize the use of limited resources. Preventive maintenance activities can yield significant cost savings by avoiding costly major repairs and reconstruction. A data-driven program can provide increased efficiency by identifying when condition-related activities should be scheduled.

As Columbia continues to grow, implementation of the recommended bridge preservation program can help the city meet its future transportation demands by keeping its network of bridges in good condition using limited resources.

Implementation Readiness

Key recommendations for the program include the identification and prioritization of low-cost preventive maintenance activities such as cleaning, periodic washing of bridges, and sealing of bridge decks that are currently in good condition (first table on next page).

The recommendations also include practical and implementable technologies for bridge preservation and short-term (12 to 24 months after program implementation), mid-term (24 to 72 months after program implementation), and long-term (73 to 120 months after program implementation) preventive maintenance activities (second table on next page).

Priority action items for preventive maintenance

Activity	Priority	Rationale	Selection Criteria
Seal cracks in bare concrete decks	ASAP	Reduces deterioration immediately by preventing ingress of moisture and chlorides. Can be completed by current maintenance personnel.	BPIP / Inspection results
Clean decks and drains	12 months	Reduces rate of corrosion immediately by removing moisture trapped against bridge materials. Can be completed by current maintenance personnel or temporary staff.	BPIP / Inspection results
Clean beam seat areas of debris	12 months	Reduces rate of corrosion immediately by removing moisture trapped against bridge materials. Can be completed by current maintenance personnel or temporary staff.	BPIP / Inspection results
Implement bridge deck washing / flushing program	24 months	Reduces rate of corrosion of bridge elements. May have a smaller impact than simply removing debris from the surface, and costs are higher.	All bridge decks
Implement bridge superstructure washing	24 months	Reduces rate of corrosion in bridge elements. Smaller impacts than simply removing debris from the surface, and costs are higher. Elements that require washing are difficult to access, and pressure washing is required.	Prioritize steel bridges and bridges with open or leaking joints
Implement a bridge deck sealing program	24 months	Extends the deck's service life and reduces its deterioration rate. Costs more than other activities and may require contractors. Maintenance personal can seal decks with some training.	See DOT recommendations
Clear vegetation	36 months	Improves air flow through the structure and frees moisture trapped against concrete surfaces. Smaller impacts than removing debris or washing bridge elements. Low cost. Can be completed by current maintenance personnel or temporary workers.	BPIP / Inspection results
Repair leaking joints	48 months	Reduces deterioration at beam ends. Requirements depend on joint types. Costs more than other activities.	BPIP / Inspection results

Short term, mid-term, and long-term preservation activities, expected service life, and bridge selection criteria

How Soon?	Activity	Expected Service Life	Selection Criteria
Short-term (12–24 months)	Seal concrete cracks	3–5 years	All decks with cracking
	Clean out and repair drainage system	1 years	All decks with drains
	Clean and wash decks	1 years	All bridges
	Clean and wash beam ends / seats and bearings	1–2 years	Bridges with accumulated debris and leaking joints
	Seal decks	10 years	Bare concrete decks in good condition
	Seal HMA cracks	3–5 years	Asphalt decks with cracking
Mid-term (25–72 months)	Seal joints	7–10 years	Based on inspection results
	Spot painting	7 years	Bridges with damage at beam ends
	Reseal cracks	3–5 years	Cyclical
Long-term (73–120 months)	Reseal decks	7–10 years	Cyclical