AASHTO

Guide to Preservation of Highway Bridge Decks

FIRST EDITION
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FOREWORD

The AASHTO *Guide to Preservation of Highway Bridge Decks* lists preservation treatments such as deck overlays, surface sealers and deck repairs that can extend the life of bridge decks in service. The Guide considers various deck types and the deck condition that can influence the selection of preservation treatments. The Guide presents the factors in deck capacity and durability that can influence the identification of candidates for deck preservation.

The Guide is for decks in fair or good condition with significant remaining service life. In the United States, there are 1.9 billion square feet of bridge deck in good condition and 2.2 billion square feet of bridge deck in fair condition. There are significant benefits in preservation to extend the service life of the good decks, and to delay the end of service for the fair decks.

The Guide is a collection of existing information. To develop the Guide, practices of U.S. state DOTs in selection of preservation treatments were reviewed. Procedures for application of treatments were collected. Data on performance of treatments were analyzed. Performance of a preservation treatment is measured by the years added to service life of decks due to treatment. Using existing information, the Guide presents a representative practice for deck preservation, general procedures for application of treatments, and, in examples of evaluation of costs and benefits, average performance of treatments.

The guide is a product of research directed by technical committee T-9, Bridge Preservation, of the AASHTO Committee on Bridges and Structures. Committee T-9 worked through the National Cooperative Highway Research Program to produce this Guide and a companion publication, the AASHTO *Guide to Bridge Preservation Actions.*

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SECTION 1

INTRODUCTION

1.1. GENERAL

This is a Guide to preservation of highway bridge decks.

Preservation is a program of treatments applied to bridge decks in service to keep bridge decks in good or fair condition.

Treatments are the materials and actions used to protect or repair bridge decks. Many treatments are intended to protect bridge decks from ingress of chloride ion and from freeze–thaw damage.

This Guide lists treatments for bridge decks, provides procedures for treatments, relates treatments to conditions of bridge decks, reviews methods of evaluation of bridge decks, and presents examples in evaluation of costs and benefits of treatments. Most of the content of the Guide is directed at reinforced concrete bridge decks.

Preservation of bridge decks is one task in the overall preservation of highway bridges. Preservation of highway bridges is addressed in the *Guide to Bridge Preservation Actions* (AASHTO, 2021b).

C1.1.

This Section introduces the content and organization of the Guide.

Treatments are means of preserving bridge decks in service.

1.2. PRESERVATION OF BRIDGE DECKS

Preservation of bridge decks is a program of treatments intended to

- Extend service life of bridge decks,
- Keep bridge decks in good or fair condition, and
- Reduce life-cycle costs.

Treatments include surface sealers, overlays, and waterproofing membranes with wearing course. The application of treatments often includes repairs to cracks, spalls, and delaminations.

C1.2.

Preservation is one part of the program for highway bridges of a transportation agency. The bridge program includes a capital program for bridge rehabilitation and replacement, plus a preservation program for bridge protection and repair. Similar categories are applied to bridge decks. Protection and repair of decks are within preservation programs. Deck replacements are beyond preservation programs.

Programs for bridge preservation establish boundaries on the population of bridge decks that are candidates for preservation, and on the actions that are preservation treatments.

Preservation treatments include protection and repair of existing bridge decks. Projects to improve, replace, or construct bridge decks are beyond the intended scope of a deck preservation program.

Preservation treatments delay or slow deterioration in bridge decks.

Funds available to transportation agencies are limited, and there is competition among needs in preservation, restoration, replacement, capacity expansion, and new construction. Preservation programs are manageable when a defined population of structures is addressed. Preservation programs exist within an agency when decisions in allocation of funds are taken at the program level rather than the project level.

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1.3. PRESERVATION CANDIDATES

Preservation programs address a defined population of bridge decks. These are bridge decks that meet criteria in

- Work history,
- Capacity,
- Robustness, and
- Durability.

Work History—The history of preservation work completed on a deck should be considered when selecting bridge decks for preservation.

Capacity—Bridge decks selected for preservation should have adequate traffic capacity and adequate geometry.

Robustness—Bridge decks selected for preservation should have desired resistance to extreme events.

Durability—Bridge decks selected for preservation should have design details and construction materials that provide adequate resistance to deterioration.

An overriding criterion for preservation of a bridge deck is preservation of the bridge. The bridge, as an entire system, should be a candidate for preservation. Candidates for bridge preservation are discussed in AASHTO (2021b).

C1.3.

Bridge owners are free to set specific requirements for each of the four criteria: history, capacity, robustness, and durability. General guidance is provided here.

Capacity—Bridge decks should have adequate load rating, adequate number of travel lanes, adequate lane widths and vertical clearances, and adequate alignment.

Criteria for capacity of bridge decks can vary by route functional class and by traffic volume. Low-volume roads may have requirements for capacity that differ from requirements for high-volume roads. For all route functional classes, bridge owners set criteria for adequate decks.

Robustness—Bridge decks should have adequate resistance to earthquakes, floods, storm surges, and tsunami.

Durability—For reinforced concrete decks, durability is provided by adequate protection for reinforcing steel, by adequate deck thickness, by aggregate that is not vulnerable to alkali–silica reaction, and by mix designs that are not too permeable to water.

1.4. ORGANIZATION OF THE GUIDE

The *Guide to Preservation of Highway Bridge Decks* is presented in five sections and three appendices. The sections are:

- Section 1: Introduction
- Section 2: Preservation Treatments for Bridge Decks
- Section 3: Evaluation of Bridge Decks
- Section 4: Selecting Preservation Treatments for Bridge Decks
- Section 5: Costs and Benefits of Deck Preservation

The appendices are:

- Appendix A: Preservation Treatments for Highway Bridge Decks
- Appendix B: Defects in Highway Bridge Decks
- Appendix C: Selection of Preservation Treatments for Bridge Decks

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1.5. AUDIENCE FOR THE GUIDE

The Guide is intended for staff involved in bridge preservation at bridge-owning agencies.

1.6. RELATED DOCUMENTS

Preservation of bridge decks is related to the design of decks and to the preservation of deck joints. Two AASHTO publications are useful: the *Guide Specification for Service Life Design of Highway Bridges* (AASHTO, 2020), and the *Guidelines for Maintaining Small Movement Bridge Expansion Joints* (AASHTO, 2021a).

1.7. BRIDGE DECKS ADDRESSED IN THE GUIDE

The Guide provides information on the preservation of steel-reinforced concrete bridge decks. The Guide has minimal information on steel grid decks and timber decks. Steel orthotropic decks are covered in Connor et al. (2012).

1.8. APPLICATION OF THE GUIDE

The Guide presents general information on preservation treatments for highway bridge decks. Bridge owners can adapt information in the Guide to form or to improve their practices in preservation of bridge decks. A necessary step in adapting this Guide is the substitution of owner-specific policies, costs, and performance values in place of the general information in this Guide.

C1.7.

As of 2018, among bridges subject to U.S. Federal regulation, 86 percent by count and 96 percent by bridge deck area are steel-reinforced concrete bridge decks (FHWA, undated). The Guide is directed at reinforced concrete bridge decks. The Guide has some content on timber decks, and on steel grid decks. Steel orthotropic plate decks and decks for movable bridges are not addressed in the Guide.

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