RESEARCH in Progress

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Guidebook for Restoring Structural Integrity of Covered Bridge Members

Covered bridge members can be compromised by decay, insect attack, or a range of nonbiologic factors. Although some publications describe methods of inspecting covered bridges for degradation, little information is available to guide decisions once a problem is detected. Assuming the cause of degradation is addressed, a decision still must be made as to whether the member can continue to function without corrective action, or how it can be repaired, reinforced, or replaced while retaining the maximum amount of historic fabric.

Background

Careful consideration of repair and/or rehabilitation of original bridge components is a cornerstone of the National Historic Covered Bridge Preservation Program. Maintaining the structural and architectural fabric of these American bridges is critical to historic preservation goals. However, after assessing condition of these structures, very conservative decisions are usually made when replacing members because of uncertainty about long-term effectiveness of repair techniques. To make better informed decisions, engineers need more supporting technical data on the effectiveness and durability of various repair techniques for covered bridges to support their replacement and repair decisions. They need clear evaluation and description of repair techniques with adequate durability to extend the service life of bridge components. Possible rehabilitation techniques may include traditional timber framing or fasteners; epoxy injections; axial post-tensioning techniques to strengthen tension members, such as lower chords; fiber-reinforced plastic plates to reinforce top chords and floor beams; and improved replacement members of engineered wood products or pressure-treated lumber. Where widespread weaknesses and defects (such as requirements for increased load capacity) are found, post-tensioning applied to the structure as a global system also has potential. For maintaining long-term structural integrity of bridge members, application of remedial preservative treatments may be warranted.

Figure 1. Bottom chord repair on a Haupt truss.
Photograph courtesy of DCF Engineering, Inc.

Objective

This study will develop a guidebook for engineers describing effective rehabilitation techniques to restore structural integrity of covered bridge members while retaining the maximum amount of historic fabric.

Approach

The study objectives are being achieved through a series of interrelated tasks. A literature review of traditional and recent rehabilitation and repair techniques for covered bridge members will be used to summarize existing published and practical knowledge on repair methods. Bridges that may serve as examples of

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Figure 1. A tapered splice in a truss chord ready to receive a wedge. ***Photograph courtesy of DCF Engineering, Inc.***

effective repairs are being identified through discussions with covered bridge associations, structural engineers, bridgewrights, and bridge contractors. Site visits are being conducted to document and review the repairs with engineers and contractors involved with the repairs. Research findings and field documentation of covered bridge repairs are being reviewed with project consultants to establish an effective means of publishing guidelines to convey the means of implementing effective, sustainable repairs to structural engineers that are responsible for designing repairs for covered wood bridges.

Expected Outcomes

The project work will be summarized in a guidebook that includes an overview of the role of assessment and engineering analysis of a covered bridge prior to considering repair options; a review of available literature and practical information on repair techniques for covered bridge members; documentation of repairs to covered bridge members; the means of implementing effective repairs while considering the historical character of the bridge, historical accuracy of the construction, and expected cost, practicality, and long-term durability of repair options; photographs of bridge members before and after the repairs, when available; and a list of references. The guide will be available in both electronic and printed formats.

Timeline

This project started in spring 2011. Completion of the literature review, project reviews, consultations with bridge repair experts, and bridge site visits is expected by August 2012. Completion of the first draft of the guide is expected by December 2012; final publication is expected by June 2013.

Cooperators

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