

Field Performance of Timber Bridges: A National Study

As many engineers begin to implement life-cycle cost analyses within the preliminary bridge design phase, there is a significant need for more reliable data on the expected service life of highway bridges. Many claims are being made about the expected longevity of concrete and steel bridges being 75 years or more, but few are based on actual performance data. Because engineers are least familiar with timber bridges; their expected longevity is often unfairly estimated at 20 years. A project is needed on a national scale that provides more reliable data about the true longevity of timber bridges in the US and allows for more accurate life-cycle assessments.

Background

Timber bridges are a viable option for the US highway system mainly along secondary roadways in rural areas (Figure 1). The current National Bridge Inventory (NBI) database includes nearly 475,000 bridge structures with a span length greater than 20 ft (6 m), with approximately 9 percent utilizing timber as a primary structural component for the superstructure. Many of these structures have been in service for more than 50 years and have performed well structurally, but have been deemed deficient for functionality purposes. In addition, many bridge inspectors are not as familiar with timber as a bridge material and tend to downgrade their condition rating in the NBI. The net result is that many engineers hold the misconception that timber is a low performance bridge material having an estimated service life of less than 20 years.

There are promising examples of length-of-service that support the long-term durability of timber bridge components. The Forest Service (FS) maintains nearly



Figure 1. Three-pinned glulam arch timber bridge located in Mason County, Washington.

3,000 timber road bridges in their transportation network. Many of them are sawn timber superstructures which were installed in the post-WWII era and are still in-service after several decades. The FS also has a fairly large population of early glulam bridges built in the 1950s that are still providing vital transportation links in the Pacific Northwest. The railroads have used timber components for bridges for over 100 years and have several sawn timber structures which have been in-service for more than 75 years. However, what is lacking in the literature is a scientific study on the long term performance of timber highway bridges in the US.

Objective

To acquire more reliable data on the performance of timber highway bridges in the United States. A better understanding of the durability characteristics of timber bridge systems and components will improve comparisons to alternative bridge materials, improve bridge design details and practices, and provide for

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improvement in extension of service life. The primary objective of this study is to assess the condition and performance of a select number of existing timber highway bridges in various climatic regions in the US and to establish a baseline for evaluating future performance.

Approach

The project is national in scope and will focus on various timber bridge structures located in the Pacific Northwest, the Arid South, the Midwest, the South and the Northeast regions. Over 100 bridges will be evaluated during this study from those states with a significant number of timber bridges (Figure 2). Several cooperators will be involved in this effort, each focusing their efforts in one of the climatic regions. The project will be jointly managed by the Forest Products Laboratory (FPL) and the Federal Highway Administration (FHWA).

Expected Outcomes

A comprehensive final report will be the primary outcome of this study. It will include detailed summaries of the methods used for the inspections and their findings. A comprehensive database of performance characteristics will also be a deliverable. Engineers will be able to use these results in forecasting the expected service life of timber bridge structures in various climate regions throughout the USA. These results will also build on the limited literature about the durability and performance of timber as a structural bridge material.

Timeline

This estimated project duration will extend 30 months, starting in July 2011. Bridge inspection work will be completed between the months of March 2012 and July 2013. A comprehensive final report draft and an inspection database are expected by December 2013.

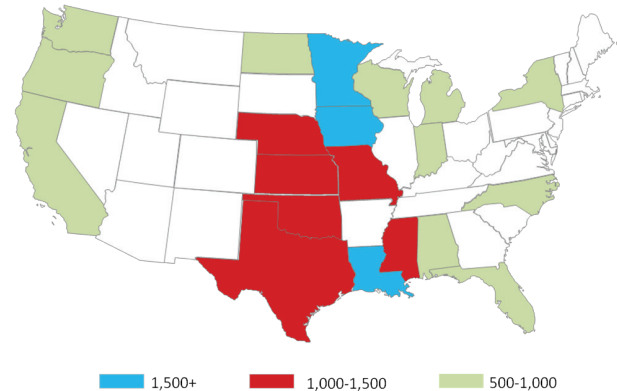


Figure 2. States with more than 500 timber bridges (National Bridge Inventory, Dec 2010)

Cooperators

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