

Improved Ratings for Covered Bridges through Load Testing—Phase II

According to the Federal Highway Administration (FHWA), approximately 880 historical covered timber bridges remain in the United States. These magnificent bridges were built with several types of heavy timber trusses that were developed during America's first century (1776–1876). These examples of early American bridge building traditions are mostly located in the northeastern United States but are also found in significant numbers in the Pacific Northwest. Pennsylvania, Ohio, Indiana, Vermont, and Oregon have the largest inventories of surviving covered timber bridges. Efforts to preserve the remaining landmark bridges had been driven by a few state initiatives and local fundraising efforts, until federal funds became available through the Transportation Equity Act for the 21st Century (TEA-21) bill that was passed by Congress in 1998. In 1999, FHWA established a National Program for the Historic Preservation of Covered Timber Bridges. The program provides grant funding opportunities for states to protect, restore, preserve, or rehabilitate their historical covered timber bridges. These bridge preservation efforts are guided by the Secretary of Interior's Guidelines for Historic Preservation.

Background

Most engineering analyses of historic covered timber bridge trusses are based solely on routine site inspections. In addition, assumptions about the behavior of connections and support conditions are made during the systemic analysis stage. This approach can lead to inaccurate and, in most cases, overly conservative load-capacity ratings for these historic structures. By conducting live-load testing to assess the overall performance of the superstructure system, engineers will



Live-load testing on a covered bridge.

be able to perform structural analyses in a more reliable fashion. The measured live load response should also provide a measure of the effectiveness of various structure modeling techniques. The end result should be a more reliable approach to assigning safe load-capacity ratings for historic covered bridges.

During Phase I of this project, 11 covered bridges were evaluated by live-load testing methods: three covered bridges in Parke County, Indiana, built of variations of the Burr-Arch truss configuration; four covered bridges in the State of Indiana built of variations of the Howe truss configuration; and four covered bridges in the State of Vermont built of variations of the Queen post truss configuration.

Objective

This study will continue the work initiated in Phase I to develop and establish recommended procedures for safely and reliably load-rating historic covered bridges through physical testing.

Partners of the National Center for Wood Transportation Structures



U.S. Department of Transportation
**Federal Highway
Administration**

Approach

- Develop field protocols for live-load testing of historic covered bridges, in conjunction with analytical modeling data requirements
- Conduct live-load testing on several bridges representing the main truss types that have been preserved
- Analyze load-testing field data and disseminate data to analytical modeling efforts
- Develop a rationale for incorporating physical test data into existing load-rating procedures
- Prepare a comprehensive guidance manual that documents recommended procedures for live-load testing and enhanced load rating of historic covered bridges

Expected Outcomes

The guidance manual will be prepared in a format similar to existing rating guides and will include recommendations for (a) setting the maximum experimental load that can be safely applied to the structure; (b) methods of loading the bridge; (c) selection and placement of instrumentation; (d) procedures for ensuring quality data; and (e) procedures to analyze collected data and establish load ratings.

Timeline

Preliminary planning for field activities will take place in 2013. Field work, including live-load testing, will take place during summer–fall seasons from 2014 to 2016. The final report will be drafted by September 2017.

Cooperators

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