

Development of Standard Plans for Glulam Highway Bridges

The main emphasis of this project will be updating available glued-laminated timber (glulam) bridge design standards to meet the 2007 AASHTO–LRFD Bridge Design Specifications. There is a need to provide basic engineering guidance to practicing engineers regarding the design and fabrication of timber bridge systems. Engineering design aids in the form of standard plan drawings, details, and specifications have proven to be effective guidance tools.



A two lane, 87-foot glulam girder bridge designed to meet AASHTO HS25 live loading.

(LRFD) for designing structures, and bridge design remains a main category. Engineers and designers wanting to satisfy the LRFD criteria for timber found a lack of a cohesive design process for doing so. Referring to the existing standards did not reflect current design practices. To revise and update the existing standards document with current LRFD designs would, once again, put timber bridges on a par with steel and concrete structures and increase their visibility and acceptance.

Background

In the United States, the need for cost-effective bridge structures meeting the ever changing loading and design criteria base is increasing and becoming more important with shrinking municipal budgets. Timber bridges have fulfilled that need, especially with updated technical information made available in the 1990s. Augmenting the popular *Timber Bridges—Design, Construction, Inspection, and Maintenance* manual, published by the USDA Forest Service, was the equally popular *Standard Plans for Timber Bridge Superstructures*. This document finally put into the hands of owners and design engineers a comprehensive tool for determining how timber could help them solve their bridge needs. Both of these timber bridge design aids are based on the allowable stress design (ASD) design approach that has been used for decades.

The engineering design community recently adopted an approach based on load and resistance factor design

Objectives

This study will develop updated and standardized design information for glulam highway bridges in accordance with the current American Association of State Highway and Transportation Officials AASHTO–LRFD Bridge Design Specifications. Four different superstructure types are included: longitudinal glulam deck, stress-laminated glulam longitudinal deck, transverse glulam deck on longitudinal glulam girders, and transverse glulam deck for longitudinal steel girders.

Approach

The development of these updated bridge design standards and specifications is divided into several tasks:

- Task A—Research existing and new design standards
- Task B—Develop design procedures and implement computer designs
- Task C—Generate design data

Task D—Compile data for presentation format, including CAD drawings

Task E—Review

Expected Outcomes

The primary output from this project will be an updated and user-friendly set of standard bridge design aids for glulam timber highway bridges. They will be available to the general public in a variety of forms through the *National Center for Wood Transportation Structures* (woodcenter.org) website:

- Electronic (PDF) versions of the as-printed publication
- AutoCAD drawings available for download
- Design example calculations derived in MathCAD (PDF) for each bridge type

Timeline

Review of existing design standards will be completed by June 2010. Establishing design procedures for each superstructure type will be

completed by September 2010. Bridge design calculations for each bridge type, based on design loading and bridge deck dimensions, will be completed by January 2011. The final draft of the standard bridge plans is targeted for completion by September 2011.

Cooperators

USDA Forest Service, Forest Products Laboratory
Laminated Concepts, Inc.

Contact Information

James Wacker
USDA Service
Forest Products Laboratory
Madison, Wisconsin
(608) 231-9224; jwacker@fs.fed.us

Matthew Smith
Laminated Concepts, Inc.
Big Flats, New York
(607) 562-8110; matt@lamcon.com