CROSSINGS
NEWSLETTER OF THE WOOD IN TRANSPORTATION PROGRAM

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In This Issue

Standard Plans for Timber Bridge Superstructures

Now available to the public.

Interest in timber bridges has increased significantly in recent years, primarily as a result of two national programs established by Congress. The programs are the Wood In Transportation Program (formerly known as the Timber Bridge Initiative) and the Timber Bridge Demonstration and Research Program (part of the 1991 Intermodal Surface Transportation and Efficiency Act). These legislative actions provided national emphasis on wood transportation structures and resulted in programs focusing on modern timber bridge projects, research, and technology transfer. Within the area of technology transfer, a high-priority need identified by bridge designers and builders has been the development of standardized timber bridge designs and specifications. By providing the basic design information on specific timber bridge types, standard plans and specifications should assist engineers who are not familiar with timber design.

The bridge plans presented in this publication are part of a series of standardized plans being developed for timber highway bridges. The plans were developed as a cooperative effort between the USDOT Federal Highway Administration; the USDA Forest Service, Forest Products Laboratory; and Laminated Concepts, Incorporated. The plans include standardized designs and details using the Allowable Stress Design approach for seven timber bridge superstructure types. The types include five longitudinal deck and two beam systems utilizing both sawn lumber and glued-laminated timber. Specific designs include:

1. Longitudinal Deck Systems
   a. Nail-Laminated Decks (Figure 1)

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b. Spike-Laminated Decks (Figure 2)
c. Stress-Laminated Sawn Lumber Decks (Figure 3)
d. Stress-Laminated Glued-Laminated Timber Decks (Figure 3)
e. Longitudinal Glued-Laminated Decks (Figure 2)

2. Beam Systems
   a. Glued-Laminated Timber Stringers and Transverse Glued-Laminated Decks (Figure 4)
   b. Transverse Glued-Laminated Timber Decks for Steel Beam Bridges (Figure 5)

The following figures depict the types of superstructure systems that are included in the standards.

Examples of longitudinal deck systems:

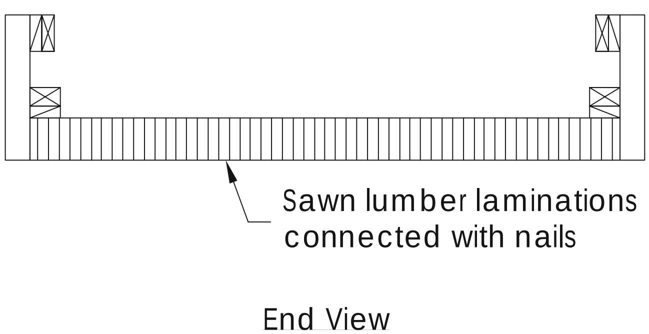

Figure 1. Typical configuration of a nail-laminated deck system.

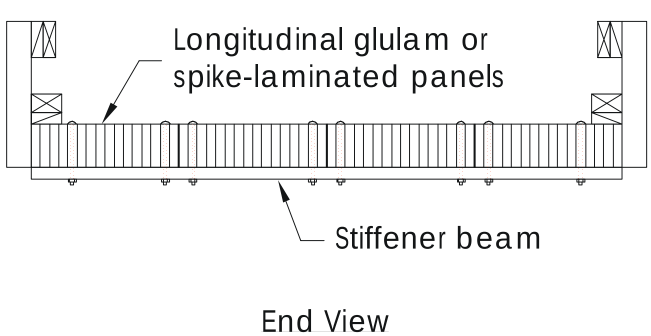

Figure 2. Typical configuration of a spike-laminated or longitudinal glulam panel deck system.

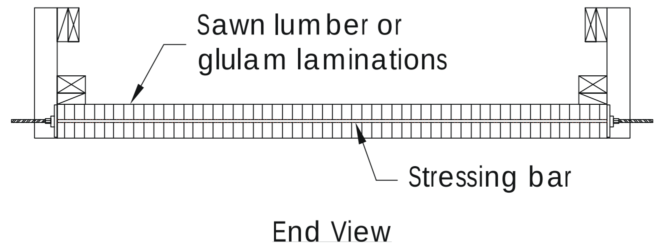

Figure 3. Typical configuration of a stress-laminated deck system.

Examples of beam systems:

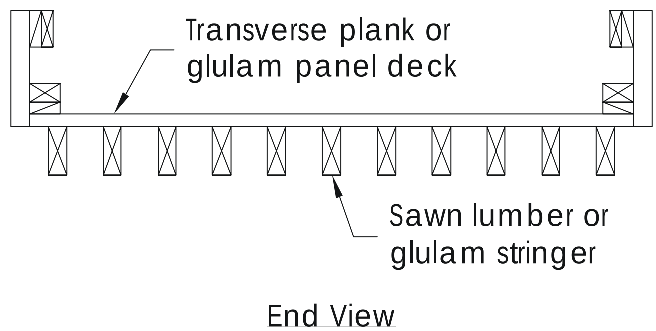

Figure 4. Typical configuration of a longitudinal glulam stringer bridge.

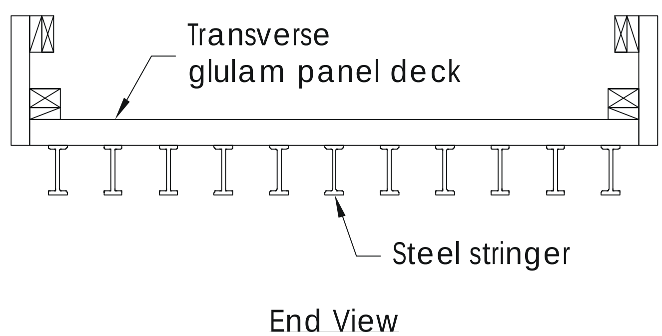

Figure 5. Typical configuration of a steel stringer bridge with a transverse glulam panel deck.

Detailed information for the deck configuration and design tables for numerous geometry and material combinations are provided. For a given bridge system, the user establishes the design load (AASHTO HS20-44 or HS25-44), span length, number of lanes (single or

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double), orientation of the crossing (rectangular or skewed), and deflection limit (L/360 or L/500). When these factors are defined, the standard plans yield the appropriate material requirements and corresponding member sizes.

In the development of these designs, every effort was made to present standardized design information in a user-friendly format and allow maximum flexibility for the use of different wood materials, species, and grades. The wood preservative choice is left to the designer, but must be included in the American Wood Preservers' Association (AWPA) Standards. The plans are based on the 1996 AASHTO Standard Specifications for Bridges, 16th Edition (with 1998 Interims). In all cases, the designs must be verified by a registered professional engineer prior to construction.

In addition, the plans include basic information regarding asphalt wearing surface construction details.

A 20-foot timber bridge consisting of transverse glued-laminated deck panels supported by glued-laminated timber stringers was designed and constructed in Bay County, Florida. The design engineer used a draft copy of the standards in the design phase of the project. A fact sheet included in this issue of *Crossings* highlights this structure. The fact sheet is also available electronically at the website listed at the end of the article. Hard copies are available by calling the phone number listed at the end of the article. Request publication number *WIT-15-0031*

In addition, Table 1 provides a summary of the deck systems included in the standard plans.

Table 1: Summary of Deck systems included in ***Standard Plans for Timber Bridge Superstructures***

Superstructure Type	Bridge Length(ft.)	Deck Thickness (in.)
Longitudinal Deck Systems		
Nail-laminated	10 - 28	8 – 16
Spike-laminated	10 - 34	8 – 16
Stress-laminated sawn lumber	10 – 34	8 – 16
Stress-laminated glued-laminated	10 – 60	9 – 24
Longitudinal glulam panel decks	12 – 38	8 – 16
Beam Systems		
Glulam stringer and transverse glulam deck	20 – 80	5.125
Transverse glulam decks for beam bridges	N/A	5 – 8.75

To obtain a copy of these new standards, contact the National Wood In Transportation Information Center (NWITIC) in Morgantown, WV at (304) 285-1591 or visit our website at *www.fs.fed.us/na/wit*. Click on "New Publications Available". Request publication number *WIT-02-0060*.

Wood In Transportation Commercialization Projects Funded in Fiscal Year 2001

In January 2001, a team of engineers and forest products technologists from the USDA Forest Service and the Federal Highway Administration selected four projects for funding in federal fiscal year 2001. The primary focus of these projects is to continue to commercialize proven technology by designing, fabricating, and installing cost-effective, structurally-sound timber structures. In addition, these projects will focus on using local timber resources and businesses to the extent that is practical.

A brief description of each project is listed below:

Commercialization Project in Richland County, ND: The Richland County Highway Department will receive $150,000 for the construction of four bridges consisting of cottonwood glued-laminated decks supported by steel beams. The primary goal of this project is to economically replace existing bridges with new structures capable of adequately handling flood flows, ice jams and traffic loads while providing safety for the motoring public. The four structures have been selected for their similar dimensions (28 feet by 26 feet) and relative close proximity to each other. The bridges will be designed to AASHTO HS-20 design specifications. Preservative treatment will be creosote. This project will be modeled after a similar commercialization project completed in Ida County, IA in 1999.

Commercialization Project in West Virginia: The WV Division of Highways will receive $75,000 for the construction of eight bridges. The bridges will be approximately 20 feet long by 16 feet wide using southern pine and/or red oak lumber. Two designs will be used: steel beams supporting transverse nail-laminated timber decks and steel beams with timber plank decks. The bridges will be designed to AASHTO HS-20 design specifications. Depending on the design, the preservative treatment will be either creosote or chromated copper arsenate.

Commercialization Project in Schuylkill County, PA: The Schuylkill River Greenway Association will receive $82,000 for the demonstration and evaluation of southern pine glulam deck panels on an abandon railroad bridge. The redecking of this bride is a critical link in the development of a local rail-trail. The deck panels will be fastened to the existing steel structure using a new fastener system developed at The Pennsylvania State University called the "Welded Steel Stud & Epoxy Grout" (WSSEG) connection. Preservative treatment will be creosote. The wearing surface for the bridge deck will be a recycled tire mat product.

Special Project in New Hampshire that will analyzing Costs and Benefits of Modern Timber Bridges Installed in New Hampshire Since 1990: The Southern New Hampshire Resource Conservation and Development Area Council, Inc. will receive $6,820 to conduct an inventory and analysis of each modern timber bridge constructed in New Hampshire since 1990 and to create a greater awareness, support, and demand for modern timber bridge structures. The purpose of the study is to attain a greater understanding of the economic, cultural and resource utilization advantages and disadvantages of using modern timber bridge structures in New Hampshire.

For additional information about these projects, contact the National Wood In Transportation Information Center at 304-285-1591.

Notice

How can we improve the National Wood In Transportation Information Center Website?

The Center staff is constantly working to improve our website. If you have suggestions or comments on how the staff can improve the website, please let us know by contacting the Center at 304-285-1591 or send a message to Ed Cesa at ecesa@fs.fed.us.

The National Wood In Transportation Program CD-ROM

Information on Modern Timber Bridges in the United States

As part of the technology transfer focus of the Wood In Transportation Program, the USDA Forest Service, Forest Product Laboratory; the USDOT, Federal Highway Administration; and the USDA Forest Service, National Wood In Transportation Information Center recently completed a CD-ROM. It contains 224 publications from 1988 to 2001 that document research and project activities of both the Federal Highway Administration's Timber Bridge Program as well as the Forest Service's Wood In Transportation Program.

Documents on the CD are in PDF format and include the popular "Timber Bridge Manual," standard drawings, monitoring reports, research results, timber bridge project reports, back issues of *Crossings*, demonstration timber bridge fact sheets, journal articles, conference proceedings, and many other documents. In addition to using the regular Adobe Acrobat search, the CD has a customized search engine that enables the user to search for publications by Title, Author, Year, and Full Text.

The manufacturer, Mira Digital Publishing, Inc., will provide assistance to users of the CD by calling or e-mailing the company's address listed on the CD cover. This service will be provided for one year.

To order your copy of the CD, please call the National Wood In Transportation Information Center at 304-285-1591 or visit our website at *www.fs.fed.us/na/wit*. Click on "New Publications Available." Request publication number *WIT- 01-0035* (or complete the attached form).

Guide for Minimizing the Effect of Preservative-Treated Wood on Sensitive Environments

Preservative-treated wood is often used for construction of highway and pedestrian bridges, wetland boardwalks, and other structures in or over water or sensitive environments. In these applications, it is important that release of preservative from the wood into the environment is minimized. This publication addresses this concern by describing the various types of pressure-treated wood, reviewing recent research on the environmental impacts of pressure-treated wood, and discussing methods of minimizing potential environmental impacts. Recent research indicates that wood treated with these preservatives does release small amounts of chemical into the environment immediately adjacent to the treated structure, although no adverse biological impacts were observed. Environmental releases from treated wood can be minimized with appropriate treatment practices. These practices include fabricating members before treatment and specifying that the wood be treated using methods that ensure chemical fixation and prevent the formation of surface residues or bleeding. Guidance to specifying such treating practices are offered in this report and in sources such as the Best Management Practices developed by the Western Wood Preservers' Institute. Also, responsible construction practices such as storage of treated wood under cover and containment and collection of construction residue can further reduce the possibility of negative environmental impacts. As with any other construction material, careful specification and responsible use of treated wood will optimize its performance.

To obtain a copy, please contact the National Wood In Transportation Information Center at 304-285-1591 and request publication number *WIT-05-0025* or visit the Wood In Transportation website at *www.fs.fed.us/wit*; click on "New Publications Available".

NEW PUBLICATIONS

Timber Bridge Economics

Interest in timber bridges has grown rapidly in recent years as a result of new technologies in design and construction as well as advances in material manufacturing and preservative treatments. Despite these advances, little is known about the initial and life-cycle costs of timber bridges relative to those of other construction materials. The objectives of this study were to evaluate the cost characteristics of timber bridges and to compare the initial cost of timber bridge superstructures with that of bridges constructed of steel, concrete, and prestressed concrete. For timber bridges, results show a relationship between cost per square foot and bridge length, load rating, and geographic location. In general, timber bridge superstructures tended to compete with steel and concrete bridge superstructures on an initial cost basis. However, the range in cost per square foot values for all bridges varied widely. This outcome was probably due to both the high variability in these data and the relatively small sample size of the data sets for steel and concrete.

To obtain a copy, please contact the National Wood In Transportation Information Center at 304-285-1591 and request publication number *WIT-10-0005* or visit the Wood In Transportation website at *www.fs.fed.us/wit*; click on "New Publications Available".

Field Performance of Timber Bridges 19. North Yarmouth Stress-Laminated Truss Bridge

The North Yarmouth bridge was constructed in the spring of 1994 in North Yarmouth, Maine. The bridge is a single-span, two-lane, stress-laminated truss structure that is approximately 39 feet long and 32 feet wide. The truss laminations were produced using chromated copper arsenate (CCA) treated southern pine connected with metal plate connectors. This report includes information on the design, construction, and field performance of the bridge. Performance of the bridge was monitored for approximately four years, beginning shortly after bridge construction. During the field monitoring program, data were collected related to the wood moisture content, the force level of the stressing bars, behavior under static truck loading, and overall structural condition. Based on four years of field evaluations, the bridge is performing well with no structural or serviceability deficiencies.

To obtain a copy, please contact the National Wood In Transportation Information Center at 304-285-1591 and request publication number *WIT-06-0039* or visit the Wood In Transportation website at *www.fs.fed.us/wit*; click on "New Publications Available".

Article contributions, questions or comments may be sent to Ed Cesa, Program Coordinator, National Wood In Transportation Information Center or Mr. Chris Grant, Program Assistant, USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505; Phone: 304-285-1591; FAX: 304-285-1587, or e-mail cgrant@fs.fed.us. A change of address may also be sumnitted to cgrant@fs.fed.us. For publication requests, e-mail jnorth@fs.fed.us.

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