TBIRC
Timber Bridge Information Resource Center

CROSSINGS

NEWSLETTER OF THE NATIONAL TIMBER BRIDGE INITIATIVE

Editor - Tinathan Coger *Issue 21* *November 1995/February 1996*

Standard Plans for Southern Pine Bridges

A new publication for bridge engineers and highway officials – in response to their information requests

Interest in timber bridges has increased significantly in recent years, primarily as a result of programs implemented through the National Timber Bridge Initiative that was passed by Congress in 1989. During this period, the development of standardized timber bridge plans and specifications has been continually emphasized by bridge designers and builders as a key element for contributing to improved design and construction practices. Additionally, standard plans have been viewed as a beneficial tool for helping engineers address the critical transportation infrastructure needs of state, county, and rural regions. To meet this need, several projects to develop standardized timber bridge plans have been initiated at the Federal and local levels based on modern technology for design, fabrication, and construction.

The bridge plans presented in this publication are the first step in developing standardized designs for the southern United States where Southern Pine is the primary structural wood species group. The plans were developed as a cooperative effort between the USDA Forest Service, Forest Products Laboratory; the University of Alabama; and the Southern Pine Council.

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Budget Uncertainty Will Impact National Timber Bridge Initiative

Focus of the National Timber Bridge Initiative in Fiscal Year 1996

Funding for the National Timber Bridge Initiative (NTBI) is provided through the Interior and Related Agencies Appropriation Act for fiscal year 1996, and as of press time, has yet to be enacted into law. Currently, the NTBI is working under a stop-gap spending measure, a Continuing Resolution, which provides program funding through March 15, 1996. Preliminary indications are that the past budget of $1.7 million could be reduced by $500,000. If this happens, instead of having approximately $1 million for cost-share demonstration projects, there will be approximately $600,000. This will result in severe competition for the limited federal dollars available for demonstrating potential benefits of using modern timber bridges as an option to improving our transportation infrastructure. Only time will tell as to what will happen. In the meantime, NTBI has identified three critical objectives to focus on in fiscal year 1996. They are:

1. Commercialization of modern timber bridge technology that has been developed
2. Innovation that leads to:
   a. identifying cost-saving strategies
   b. improving the performance of existing designs
3. Broadening the Initiative into the following key areas: portable timber bridges for stewardship management activities, tourism infrastructure, and railroad infrastructure.

In order to accomplish these objectives, the NTBI has added a new grant program called "commercialization projects." The purpose of these projects is to foster the commercialization of modern timber bridge technology that results in the most cost-effective, structurally sound bridges being built and demonstrated – preferably using local timber resources as well as local businesses and employees. An example of a potential commercialization project is constructing four bridges of a standard design in a given area.

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Timber Bridge Design Awards Announced

The following article is condensed from the brochure "Award Winning Timber Bridges Summer 1995"

This article describes nine outstanding timber bridges which have received top industry awards from the 1995 National Engineered Timber Bridge Design Award Competition. Many of these bridges were specified by highway and municipal engineers after an intensive analysis of timber, steel, and concrete bridge designs. In each case, the timber structures were selected because of their superiority in terms of cost, appearance, expected long life and low maintenance, and/or speed of construction.

The judges for the 1995 Timber Bridge Award Competition were Mike Ritter, USDA Forest Service; Sheila Duwadi, Federal Highway Administration; Bruce Pooley, American Institute of Timber Construction; and Tom Williams, American Wood Systems, a related corporation of American Plywood Association (APA).

The Timber Bridge Awards Program was sponsored by the American Forest and Paper Association's (AF&PA) Wood in Transportation Structures Subcommittee. Financial support for the awards program comes from the USDA Forest Service (National Timber Bridge Initiative); American Forest and Paper Association; Southern Forest Products Association; American Institute of Timber Construction; and American Wood Systems of APA.

EDITOR'S NOTE: The sponsors have produced a full-color, eight page brochure titled" Award Winning Timber Bridges, Summer 1995." This brochure highlights each of the award winning bridges. To receive your copy, contact: The Timber Bridge Information Resource Center, USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505. Phone: 304-285-1591.

The following synopsis identifies the categories and provides a brief description of the respective winners.

Vehicular Bridges - Main span over 40 feet

First Place:

Pigeon Creek Bridge, Dent County, Missouri. This post tensioned modular T-Beam bridge is 222 feet long and 36 feet wide. Pigeon Creek is the first stress-laminated wood bridge built for the Missouri Highway and Transportation Department. The bridge has four 55 foot spans with eight T-beam modules per span. The bridge has a 7" thick asphalt wearing surface. Designer and owner of the bridge is the Missouri Highway and Transportation Dept., Division of Bridges in Jefferson City, Mo. The contractor/erector was Pace Construction Company in St. Louis, MO.

Award of Merit:

Highway 15 Over Flemington Creek, Edgar County, Illinois. This bridge is a 120 foot length utilizing three simple span sections of 30, 60, and 30 feet. A stress-laminated glulam "T" system was selected for the 60 foot center span. This unique system combines modern engineering principles and materials to increase the load carrying capacity of this timber structure. The bridge was designed by WVP Corporation in Decatur, IL. Contractor/erector was Frank C. Feutz Construction Company in Paris, IL, and the owner is Edgar County Highway Department in Paril, IL.

Hiroshima Airport Bridge, Hiroshima, Japan. This bridge is 469 feet long, and the first cable stayed highway bridge in Japan constructed with a timber superstructure. The bridge utilizes two 154 foot high reinforced concrete Gothic arch towers. Each tower supports wire rope cables for the stayed suspension system that supports thirteen parallel chord truss bridge sections. Each parallel chord truss has glued laminated timber top and bottom chords and webs. The main clear span of this bridge is 273 feet. The bridge was designed by Western Wood Structures, Inc. in Tualatin, OR. The contractor/erector was Mitsui Wood System/Nippon Enterprises in Tokyo, and the owner is the Hiroshima Airport in Hiroshima.

Vehicular Bridges - Main Span under 40 feet

First Place Award:

Highland Avenue Bridge over Smokes Creek, Orchard Park, New York. The final design for the 29-foot clear span bridge called for the use of simple span longitudinal glued laminated deck panels supported on steel sheet abutment with transverse stiffener beams to minimize differential deflection between adjacent deck panels. Timber railings were used on the bridge structure, with steel backed timber rails and posts used on the approaches. The bridge was designed by Pratt and Huth Associates in Williamsville, New York. It was fabricated by Laminated Concepts Inc. in Elmira, NY. The contractor/erector was Pine Ridge, Inc. in West Falls, NY. The owner is the Town of Orchard Park, NY.

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Timber Bridge Design Awards Announced ... *continued from page 2*

Award of Merit:

Scalpy Hollow Bridge, Drumore Township, Lancaster County, Pennsylvania. This timber bridge design has a total length of 34 feet, 9 inches, with a width of 26 feet. The superstructure utilizes seven glued laminated timber stringers with glulam transverse deck panels, curbs, and railings. The design firm was Herbert, Rowlan & Grubic, Inc. of Lancaster, PA. The contrator/erector for the timber supertructure was Laminated Concepts, Inc. in Elmira, NY. The owner is Drumore Township, PA.

Key Wallace Drive Bridge over the Little Blackwater River, Dorchester County, Maryland. This bridge is on a horizontal curve and consists of six spans with an overall length of 131 feet and a clear roadway width of 28 feet. The unique superstructure uses glued laminated longitudinal deck panels, 14" deep and 4 feet wide. The panels were stepped across the bridge to develop the superrelevation. The bridge was designed by Wallace, Montgomery, & Associates Engineers in Towson, Maryland. The contractor/erector was Erik K. Straub, Inc. in Cambridge, Maryland, and the owner is Dorchester County, Maryland.

Pedestrian/Light Vehicular Bridges

First Place Award:

Blossom Music Festival Bridge, Akron, Ohio. This bridge is a glued laminated beam structure. The bridge was divided into three sections with an 80 foot center section supported by 55 foot and 35 foot cantilevered end sections. The bridge is 20 feet wide with an overall length of 170 feet. Stringers, deck, and curbs were treated with 0.3 Type A Pentachlorophenol preservative. The balance of the material was treated with a 0.3 Type C Penta, per AWPA specifications C-28. The project designer was Knight & Stoller of Cleveland, Ohio. The timber superstructure and abutments were designed by Western Wood Structures in Tualatin, Oregon. Contractor/erector was Cavanaugh Building Corp in Akron, Ohio, and the owner is the Musical Arts Association, Cleveland, Ohio.

Award of Merit:

Ellenboro Bridge, Ellenboro, West Virginia. This bridge is 81 feet long and 12 feet wide, designed for a live load of 85 psf permitting pedestrian and light vehicular traffice. Four glued laminated beams were used as the main longitudinal support members, each measuring 48-1/8" in depth. The beams were fabricated with a camber of 13" to offset dead load deflection and provide a slight residual curvature. Decking was 3-1/8" thick transverse glued laminated decking. The bridge was designed by an in-house team at the West Virignia Division of Highways in Charleston, WV. The contractor/erector was Orders Construction Company in St. Albans, WV.

18th Hole Timber Bridge, James City County, Virginia. This bridge is one of four timber bridges at the Two Rivers Country Club's 18 hole championship golf course in the Governor's Land at Two Rivers community. The 221 foot sawn timber bridge was completed within eight weeks at a total cost of $53,700. For strength and economy, 3" x 10" rough cut floor joists 6 feet long, were supported by 12" diameter timber piles spaced 8 feet apart. Decking was 3" x 8" sawn timbers. The bridge was designed by the Structures Group, Inc. in Williamsburg, VA. The contractor/erector was Riverworks, Inc. of Glouchester, VA. The owner is Governor's Land Management Company in Williamburg, VA.

For more information on future timber bridge design competitions, contact Michael Caldwell at AF&PA, 111 19th Street NW, Suite 800, Washington, DC 20036. Phone: 202-463-2700 or FAX: 202-463-2791.

Manufacturing and Marketing Opportunities for Modern Timber Bridges in Michigan: Special Project 1995

This publication is the result of a special project conducted in Michigan. The purpose of the project was to survey road and drain commissions, engineers, and others to determine their current awareness and perceptions about modern timber bridges. The information obtained is helping to define the market niche that exists for timber bridges in Michigan.

This report highlights the results of the project and includes a variety of baseline information on modern timber bridges funded and built in Michigan and the distribution of locally-owned bridges. The project was a cooperative effort among Michigan Department of Transportation, Michigan Association of Resource Conservation & Development Councils, Michigan Department of Natural Resources (MI DNR) - Forest Management Division, MI DNR - Land & Water Management Division, Michigan State University Extension, USDA Forest Service - National Timber Bridge Initiative. Jack Pilon, MI DNR, prepared the report.

Copies can be obtained by contacting the TBIRC office at 304-285-1591 or Jack Pilon, MI DNR at 517-275-5151.

A Letter to the Editor

Mr. John Brennan, Executive Director, Southern Pressure Treaters Association, Gulf Shores, Alabama, submitted the following comments in response to the article, "Maintenance Practices for Wood Bridges" that appeared in the 20th issue (August 1995) of *Crossings.*

Mr. Brennan stated, "... The article reminded me of what the concrete and steel representatives and those who favor these products want the audience to think. They seem to favor the idea of inspection for their products and the word maintenance for wood products. The emphasis on the maintenance for wood is intended to overcome the higher initial cost of their products and at the same time be negative to wood.

The real truth is, if the buyer or specifier performs what I like to call the "proper preventive maintenance," the treated wood will require less maintenance and last as long or longer than other bridge materials. In areas where deicing salts are used or coastal areas subject to salt air breezes, treated wood will have a two to three times longer life expectancy than other bridge materials.

The secret is the "preventive maintenance" that needs to be done, and it is the 3 Cares as follows:

1. *Care in design*: Design the bridge properly and this includes providing for a good complete rainwater run-off and the preframing of the members so as to practically eliminate the need for field framing. Also require the proper hardware for the materials specified.

2. *Care in treatment*: Purchase wood that is properly treated in accordance with AWPA Standard C-14 (see AWPA M1) and provide for an independent inspection (see AWPA M2) to be sure that it is. Preservatives such as creosote that greatly retard the rate of moisture absorption as well as wood species that permit a deep penetration of the preservative such as Southern Yellow Pine or similar species should be preferred because of their treatability and historical performance record.

3. *Care in construction*: Keep field framing at a minimum and where it is required provide for a thorough field treatment in accordance with AWPA Standard M4-95, especially see all of the requirements under paragraphs 1.5 and 2.2 are met. See that construction allows for proper water run-off and no puddling. Use the proper and sufficient hardware as specified. Take pride in building a maintenance free bridge.

If the designer, the treater, and the builder will properly perform their respective jobs in 1, 2, and 3 listed, the bridge buyer should have a 20 to 25 year maintenance free bridge.

We do know timber bridges that have been properly treated have had a proven demonstrated average life expectancy of 40 to 50 years or more and normally require a minimum of maintenance during their life.

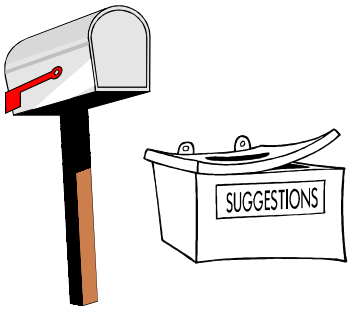
All bridges, no matter what material is used to construct them, should be subject to an adequate inspection program designed to correct any inefficiencies found. The article seemed to favor a fixed periodic maintenance program. While I favor good maintenance, I don't believe in performing unnecessary maintenance, so I think in terms of a good inspection program that controls the individual maintenance to be performed with the deficiencies at each bridge site in accordance with their magnitude.

One thing I believe the wood interest needs to do is to have the city, county, or state entities including the public look at the competitive costs of concrete, steel, and wood. Normally the completed overall cost is less for wood.

If, for instance, a $1,000,000 steel or concrete bridge could be built with wood for $900,000, and you opted to build it in wood and invest the $100,000 of savings earning a compounded interest rate of 6 percent, then in 40 years, the life expectancy of the timber bridge, you would have enough money, $1,028,572, to rebuild a new bridge at today's cost.

Hopefully the city, state, and county highway people will look more carefully at our treated wood products as others in the construction trade have and are doing. In 1955, the market for treated wood lumber, timber, and plywood was 39 million cubic feet, in 1994, it was 472 million cubic feet or a material growth of 1,210 percent.

We have had a phenomenal growth because we have an excellent low maintenance, low cost, and superior product. Articles that indicate significant maintenance is required of treated wood may be unfairly misleading."



Standard Plans for Southern Pine Bridges ... *continued from page 1*

The plans include standardized designs and details for three timber bridge superstructure types including stress-laminated sawn lumber bridges, stress-laminated glued laminated timber (glulam) bridges, and longitudinal sawn lumber stringer bridges with transverse plank decks. The stress-laminated designs were developed at the Forest Products Laboratory, and the sawn lumber stringer designs were developed at the University of Alabama. The plans are intended to serve as a useful guide to state, county, and local highway departments in the development of practical and economical bridge designs using Southern Pine lumber and glulam. They should be particularly valuable to smaller highway departments with limited engineering staffs.

In the development of these plans, every effort was made to provide complete information for bridge superstructure design and fabrication for a range of design options. Each set of plans encompasses numerous span length and width combinations, design loadings for AASHTO HS 20-44 and HS 25-44 vehicles, and two options for live load deflection criteria. However, specific site conditions may necessitate modification because plans were developed for right-angle crossings only. In all cases, these designs must be verified by a registered professional engineer prior to construction.

Copies of the standard designs, can be obtained by contacting the Timber Bridge Information Resource Center in Morgantown, WV at 304-285-1651.

Budget Uncertainty Will Impact National Timber Bridge Initiative ...

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At the same time, we plan on maintaining and enhancing the Timber Bridge Information Resource Center (TBIRC) located in Morgantown, West Virginia by improving our customer service. We will accomplish this by:

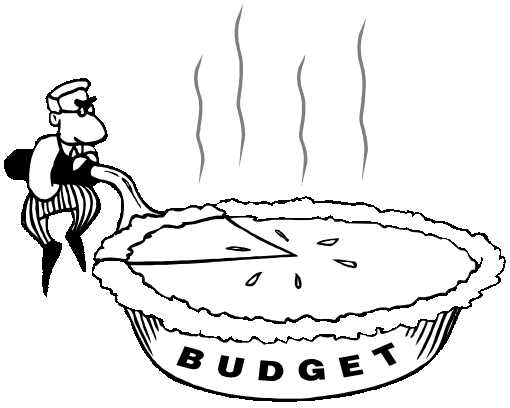
a. Developing and distributing publications that contain the most up-to-date information on modern timber bridge technology by continuing to work cooperatively with partners located throughout the country.

b. Maintaining and enhancing TBIRC's library on modern timber bridge technology that is available to the public.

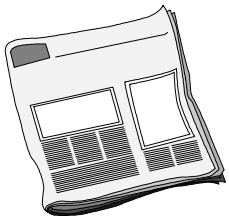
c. Increasing the amount of technical information about timber bridge technology available on electronic media (such as the INTERNET).

d. Enhancing TBIRC's database for tracking designs, costs, and other related information on demonstration projects funded by the Initiative.

In summary, the objectives that we have identified for fiscal year 1996 are a natural progression for the National Timber Bridge Initiative. Many new innovative designs have been developed during the first seven years of the Initiative. By emphasizing innovation that leads to cost savings and by improving our technology transfer efforts, we hope to meet the needs and demands that many of you have expressed in the past. It continues to be important for us to collectively work together.



NEW PUBLICATIONS



The Role of New Technology Adoption in the Timber Bridge Market: Special Project Fiscal Year 1992

Five technology transfer publications have been developed from the results of this study. The purpose of the study was to determine perceptions of timber as a bridge material in comparison to other bridge materials on preselected attributes that are held by bridge engineers and highway officials throughout the country. Primary authors of the publications are Drs. Bob Smith and Bob Bush, Center for Forest Products Marketing, Department of Wood Science and Forest Products, Blacksburg, VA. The titles of the publications are:

1. Factors Influencing the Adoption of Timber Bridges
2. A Perceptional Investigation into the Adoption of Timber Bridges
3. A Hierarchical Analysis of Bridge Decision Makers
4. Marketing Practices in the Timber Bridge Industry: 1993
5. A Strategic Evaluation of Factors Affecting the Adoption of Timber Bridges

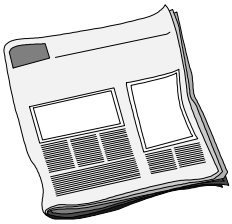
Copies of these publications can be obtained by contacting the Timber Bridge Information Rescource Center at 304-285-1651 or The Center for Forest Products Marketing, VA Tech at 402-231-5876.

Plans for Crash-Tested Bridge Railings for Longitudinal Wood Decks

A new publication for bridge engineers and highway officials – in response to their information requests

Bridge railings have historically been designed based on static-load design criteria. In the past decade, design criteria has refocused toward full-scale crash testing as a more appropriate and reliable method of evaluating bridge railings. The plans highlighted in this publication reflect the results of a cooperative research project between the Midwest Roadside Safety Facility, University of Nebraska-Lincoln; the USDA Forest Service, Forest Products Laboratory; and the Federal Highway Administration. The objective of the project was to develop and crash test bridge railings and approach railing transitions for longitudinal wood bridge decks. The bridge railings were completed in accordance with AASHTO Performance Level 1 and Performance Level 2 requirements and are described in the cited reports. One bridge railing was also tested to the requirements of NCHRP Report 350, Test Level 4. Approach railings were tested or adapted from previous testing in accordance with NCHRP Report 230. For the convenience of the user, full drawing sets have been provided in customary U.S. and SI units. The testing procedures, results, and drawings have been approved by the Federal Highway Adminstration Federal-Aid and Design Office for use on Federal-aid highway projects.

For a copy of the plans, please contact the Timber Bridge Information Resource Center at 304-285-1651.



Article contributions, questions or comments may be sent to the Program Director, Timber Bridge Information Resource Center or Ms. Tinathan A. Coger, Information Assistant; USDA Forest Service; 180 Canfield Street; Morgantown, WV 26505; Phone: 304-285-1591 or 304-285-1596; or FAX: 304-285-1505; DG: S24L08A.

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