TBIRC Timber Bridge Information Resource Center

CROSSINGS

NEWSLETTER OF THE WOOD IN TRANSPORTATION PROGRAM

Editor - Tina than Coger *Issue 22* *May 1996*

The Wood In Transportation Program

formerly the National Timber Bridge Initiative

The USDA Forest Service continues to play a leadership role, not only in modern timber bridge technology, but also in other applications for wood in transportation. These include such structures as binwalls, sound barriers, marine structures, and portable bridges for harvesting activities. As the National Timber Bridge Initiative continues to expand into these other wood in transportation applications, we changed our name to greater reflect this continuous evolution. We are now officially called The Wood In Transportation Program, not the National Timber Bridge Initiative. We believe the name change conveys to our customers and interested individuals the broad scope of our expanded program.

Examples of the Wood In Transportation Program expansion can be found in our *Wood In Transportation Special Project Summary Report: Fiscal Years 1992 Through 1995* (see details on page 8).

Fiscal Year 1996 Timber Bridge Construction Grants Awarded

The Wood In Transportation Program Evaluation Panel met during the week of February 27, 1996, at Morgantown, West Virginia, to review and recommend for funding the Fiscal Year 1996 timber bridge construction grant applications. Panel members were:

Sheila Duwadi, Federal Highway Administration

Merv Eriksson, Engineer, Region 1

Nelson Hernandez, Engineering, National Forest System

Lola Hislop, Forest Products Laboratory, Engineered Wood Products and Structures

Dean Huber, Timber Bridge Coordinator, Northeastern Area Representative

Jack Justice, Federal Highway Administration

Kenneth Kilborn, Timber Bridge Coordinator, Region 10

John Pasquantino, Legislative Affairs, Northeastern Area Representative

Michael Ritter, Forest Products Laboratory, Engineered Wood Products and Structures

William von Segen, Timber Bridge Coordinator, Region 6

Robert Westbrook, Timber Bridge Coordinator, Region 8

John Zirkle, Engineer, Region 8

Edward Cesa, Acting Program Director and Facilitator

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1995 - Third National Timber Bridge Design Competition

Judges evaluated thirteen "ways to cross the creek" during the recent Third National Timber Bridge Design Competition as thirteen student chapters of the American Society of Civil Engineers (ASCE), the American Society of Agricultural Engineers, (ASAE) and the Forest Products Society (FPS) from across the country competed for prizes. This competition was made possible by a grant from the U.S. Forest Service through its Wood In Transportation Program, formerly called the National Timber Bridge Initiative. Southwest Mississippi Resource Conservation and Development (RC&D), Inc., coordinated the competition, with the Civil Engineering Department at Mississippi State University providing technical assistance. Each chapter designed, constructed and tested their bridges on their home campus, then submitted documentation of the activities and results to a panel of judges for review.

When the sawdust and splinters had all cleared, the **first place winner** was the **University of North Carolina at Charlotte.** Their bridge incorporated two box beams (girders) prestressed longitudinally supporting a plywood deck resting on transverse floor beams. The ASCE chapter submitted the winning entry. **This entry was also judged the Most Economical and Cost-Competitive Design.**

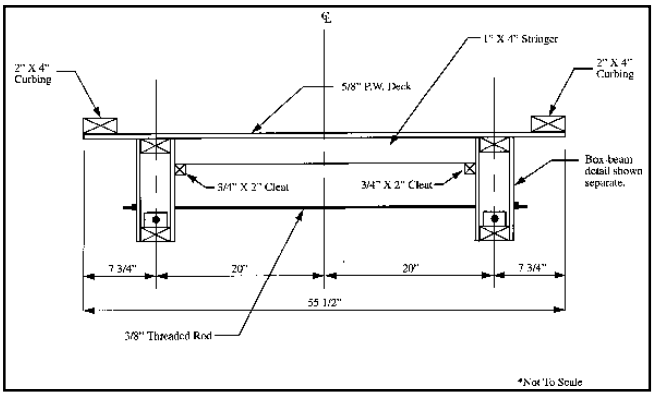
The **second place winner** was **Virginia Tech's entry submitted by the Forest Products Society**. Their design used all-wood trusses prepared from southern pine with mortice-and-tenon connections and wood dowels. **Third place** was awarded to the entry from the **ASCE chapter at Washington University at St. Louis**. Their design used 2x4 truss girders supporting a double plywood "stress-skin" deck with incorporated transverse floor beams.

The award for **Most Adaptable to Real Life Construction** went to the **University of Alabama ASCE** chapter for their entry with box beams supporting a plywood deck on transverse floor beams.

Princeton University's ASCE chapter captured the **Most Aesthetic** award with their entry using laminated ash arches supporting southern pine floor beams and a plywood deck.

Other schools entering the competition were California Polytechnic, San Louis Obispo ASAE; Mississippi State University ASCE; Marquette University ASCE; West Virginia University ASCE/FPS; San Jose State University ASCE; North Carolina State University FPS; Oregon State University ASCE/FPS; and Milwaukee School of Engineering ASCE. Notices of Intent to enter were received from the University of Alaska - Fairbanks, Ohio State, and West Point, but these schools did not submit an entry.

Judges for the competition were Catherine Marx, Southern Forest Products Association, New Orleans; Dr. Vijaya Gopu, Department of Civil Engineering, Louisiana State University; and Julian Barksdale, structural engineer, Neel-Schaffer, Inc., Jackson, Mississippi.



First Place Winner - University of North Carolina at Charlotte

Forest products suppliers and groups joined in the competition effort with student chapters in several states by donating materials, money, or expertise. In Mississippi, the Mississippi Lumber Manufacturer's Association donated funds to cover all material expenses of Mississippi State University's entry.

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Third National Timber Bridge Design Competition ... *continued from page 2*

The competition's objectives were to promote interest in the use of wood as a competitive bridge construction material, to generate innovative and cost-effective timber bridge design techniques, and to develop an appreciation of the engineering capabilities of wood among future transportation and forest products engineers.

The test bridges were approximately 10-feet long and 4-feet wide and were loaded with a test weight of approximately 4,400 pounds. Average weight of the bridge models was 133 kg. At full loading, maximum deflection ranged from 0.65mm to 7.54mm. Percent non-wood materials in the bridges ranged from 0.17 percent to 11.8 percent.

Special thanks to the Department of Civil Engineering, Mississippi State University, for their assistance in preparation of guidelines and to USDA Forest Service for providing partial funding through the Wood In Transportation Program.

For additional information on future competitions, contact Southwest Mississippi RC&D, Inc., 747 Industrial Park Road, N.E., Brookhaven, MS 39601, phone 601-833-5539, FAX 601-835-0054; or Dr. Ralph Sinno, Department of Civil Engineering, Mississippi State University, phone 601-625-3050.

—— Bennie F. Hutchins
Southwest Mississippi
RC&D Coordinator
USDA, NRCS

RC&D is a rural development program of the U.S. Department of Agriculture administered through the Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service).

National Conference on Wood Transportation Structures

The Federal Highway Administration (FHWA) and the USDA Forest Service, Forest Products Laboratory (FPL), are jointly sponsoring a conference on Wood Transportation Structures in October 1996. The purpose of the conference is to present state-of-the-art information on wood utilization in transportation applications including bridges, noise barriers, and marine structures. The target audience for the conference is practicing engineers in government and private practice, and members of the academic and industrial communities.

The conference will be held in Madison, Wisconsin, on October 23-25, 1996, at facilities of the Forest Products Laboratory and University of Wisconsin. Blocks of rooms will be available at several hotels. Registration will be approximately $75.00, which will include the conference proceedings, break refreshments, two luncheons, and evening social hours.

The Organizing Committee for the conference is: Sheila Rimal Duwadi, Conference Co-Chair, FHWA; Michael Ritter, Conference Co-Chair, FPL; Ed Cesa, USDA Forest Service - Timber Bridge Information Resource Center; Ronald Faller, University of Nebraska; Paul Gilham, Western Wood Structures; Fred Herbold, FHWA Office of Engineering; John Hooks, FHWA Office of Technology Applications; Russell Moody, Forest Products Laboratory; M.G. Patel, Pennsylvania Department of Transportation; and Thomas Williamson, American Wood Systems.

If you are interested in attending this conference , please contact: Diann Campbell, Conference Coordinator; Forest Products Laboratory; One Gifford Pinchot Drive; Madison, WI 53705-2390; Phone: (608) 231-9244; FAX: (608) 231-9592

Lighthouse Bridge Construction Utilizes Kevlar Technology

In 1959, near Clallam Bay, Washington, the "Lighthouse" bridge was constructed to provide vehicular access to a small subdivision and a U.S. Coast Guard light station. The 180-foot bridge consisted of a 110-foot glued-laminated pony truss superstructure.

In 1995, the existing bridge was removed and replaced with a glulam/Kevlar structure.

The new Lighthouse bridge was officially completed early this year. The HS-25 structure is 162-feet, 7-inches long and is constructed from Pacific Coast Douglas fir treated with oil-based pentachlorophenol. It consists of two spans of six glued-laminated Aramid Reinforced Plastic (ARP) beams. It is covered by 52 32-foot glued-laminated deck panels. Curb-to-curb deck width is 28-feet, 2 and 3/4-inches. The substructure was designed by Paul Guenther, P.E. of CH2M Hill, P. O. Box 91500, City of Bellevue, Washington 98009-2050. It consists of 24-inch diameter cast-in-place concrete piling with concrete pile caps.

The inclusion of a layer of ARP as tension reinforcements in the laminations is a notable departure from normal glued-laminated timber beams. Dan Tingley, D.T. Consulting, LTD, Corvallis, Oregon; Bob Leichti, Professor of Wood Technology, Oregon State University, Corvallis, Oregon; and American Laminators of Sweethome, Oregon, developed this patented process.

This high-tech tension reinforcement in glued-laminated beams allows a significant reduction in size, utilization of lower grade woods, or both. This process will potentially make glued-laminated structural members more cost-competitive with other construction materials. Western Wood Structures of Tualatin, Oregon, supplied the superstructure.

According to Chuck Schmokel, Bridge Design and Sales Director for Western Wood Structures, this bridge is currently the longest span, highway rated, ARP reinforced timber bridge in North America.

Utilization of a thrie beam rail system is another departure from the norm. Although adapted from the New York Thrie Beam rail system, it is not a crash-tested design; therefore, it is not typically allowed on Federal Aid projects. We obtained permission to use the design on our last two Federal Aid timber bridge projects because of relatively low ADT counts and speed postings. We feel that our design exceeds the service level of approved crash-tested designs currently available. We are negotiating for permission to incorporate it into our next timber bridge.

In an effort to protect the wood deck panels and beams from the weather, we designed the asphalt wearing surface to act as a roof over the entire structure. Prior to laying the asphalt, the ends of the transverse deck panels were protected from the elements by an enamel coated, galvanized steel drip rail. This prevents sun and rain from weathering the end grain.

A waterproof membrane is then placed over the entire deck surface, followed by the asphalt wearing surface: end to end, drip edge to drip edge.

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Lighthouse Bridge Construction Utilizes Kevlar Technology ...

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After the asphalt is in place, holes are punched through the asphalt and membrane to match pre-fabricated holes in the deck panels and curb. The rail system is then bolted into place sandwiching the curb, asphalt, membrane, and deck panels between the 3/4-inch thick post base and under deck plates.

The general contractor for this project was Caicos Corporation of Bainbridge Island, Washington. Their primary claim to fame is marine construction in the Puget Sound area, and this contract was their first experience in the bridge building sector. Construction proceeded smoothly, except for the logistics of building in a relatively remote job site. Once the substructure was complete, assembly of the superstructure was simple and rapid.

Oregon State University is collecting long-term moisture content and strain gage measurements through a data collection and telemetry system that has been installed on the site. Strain gages were attached to the ARP layer at a number of locations in three of the beams. Researchers will take periodic field measurements. The USDA Forest Service Forest Products Lab in Madison, Wisconsin, is also interested in conducting load deflection tests according to spokesman Mike Ritter.

We have designed and constructed a number of timber bridges over the years. We feel comfortable that our "modern" timber bridges will meet or exceed the levels of service expected from bridges constructed of competitive materials.

—

Ross Tyler, P. E.
Project Engineer
Clallam County Road Department
Port Angeles, WA

Regional Wood in Transportation Partnership

The USDA Forest Service, Timber Bridge Information Resource Center has joined efforts with five regional Resource Conservation and Development (RC&D) Councils, the Michigan Department of Natural Resources, and the New York Department of Environmental Protection to formulate a database that will provide RC&D's, local governments, and other individuals with information to assist with the building of timber bridges and other wood structures. Following are the cooperating Councils: Historic Hoosier Hills - Indiana; Northwest Michigan - Michigan; Erie Basin - Ohio; Headwaters - Pennsylvania; Seneca Trails - New York.

One of the first efforts this partnership is undertaking is the development of one-page datasheets for completed demonstration timber bridge projects in each of the five states. These datasheets will include information such as the bridge location, design, species used, cost of superstructure, and a photograph.

A goal of the partnership is to make it easier for local RC&D's and others to access information needed for designing and installing a wide range of timber structures that can be used in transportation. These structures include native timber vehicle bridges, pedestrian and trail bridges, retaining walls, box culverts, decks, guardrails, etc.

Listed on page 6 are the key contacts for each state. If you are interested in joining this partnership and/or want additional information, contact the appropriate group.

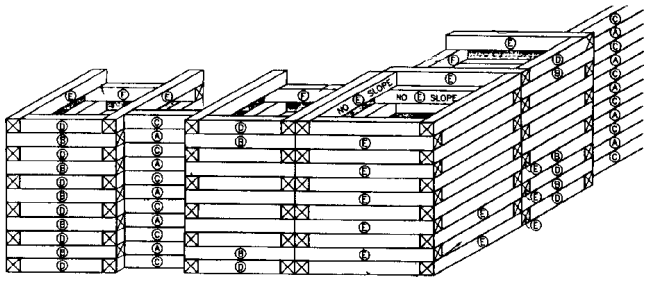
Continued on page 6

Timber Retaining Wall Drawings Available

Wood In Transportation Special Project funding assists in the development of standard drawings for retaining walls in New England

Drawings are now available that enable reasonably skilled crews, such as municipal employees and volunteers, to construct a timber retaining wall. The design uses a wood bin or crib wall design with each crib held in place by spacing timbers. Using locally grown woods in the New England area (red pine, soft maple, hard maple, beech, birch, hemlock, pines, oaks), the design has many advantages:

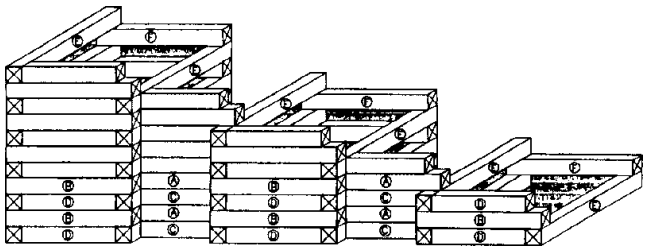
- Suitable for "do-it-yourself projects"
- Cost effective
- Adaptable to many situations



- Useable in difficult-to-access areas
- Low heavy equipment requirements
- Exceptionally rugged
- Long lasting and low maintenance
- Aesthetically pleasing

The wall design will work in a wide range of situations. A few of the practical and economical uses for the timber retaining wall include:

- Stabilize a sliding embankment
- Gain useable land at top of slopes
- Create additional parking for homes and businesses, factories, and developments
- Create a near vertical embankment where site grading options are limited, thus gaining land area at bottom of slopes



- Realign a driveway or light duty road
- Gain additional yard or grassed areas
- Elevate tees or greens on golf courses
- Stabilize stream banks

Drawings and technical advice are available at the New Hampshire and Vermont Resource Conservation and Development (RC&D) Councils. The not-for-profit RC&D Councils lead the effort to stimulate additional uses for wood as a locally available and renewable resource. They have arranged several installations in both states and have plans for more. Contact the nearest RC&D Council for information about completed walls, demonstrations, and workshops.

- North Country and Southern NH RC&D's
  Meridith, NH
  Phone: 603-279-6546

- George D. Aiken RC&D
  Randolph, VT
  Phone: 802-728-9526

- Northern VT RC&D
  Berlin, VT
  Phone: 802-828-4595

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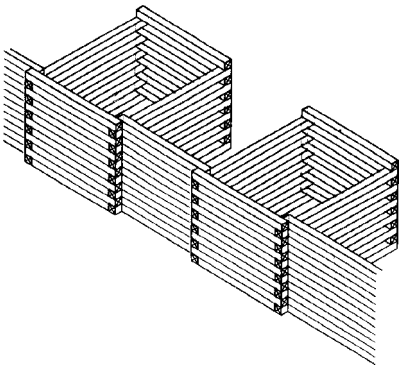

1995 - Bridge Construction Grants Awarded ... *continued from page 1*

Ninety-three proposals were evaluated, and 12 were selected for funding for Fiscal Year 1996. The total dollar amount awarded for these projects was $364,277. This amount was cooperatively matched with approximately $900,000 from state and local resources. Proposals were reviewed and rated for their technical merit, including key items such as structural integrity, rural development benefits, and cost competitiveness.

The proposals funded this year will continue to demonstrate and document how local timber resources and labor can be used to improve our Nation's transportation infrastructure. Some of these projects will also help broaden the scope of the Wood In Transportation Program.

Projects Selected for Funding

Vehicular Bridges

Alabama, Cleburne County
Arkansas, Union County
Arkansas, Washington County
Maine, Penobscot County
Michigan, Antrim County
Nebraska, Seward County

Pedestrian Bridges

Alaska, Valdez-Cordova Borough
Michigan, Ogemaw County
New York, Warren County
Oklahoma, Canadian County

Special Projects

New York, Pennsylvania, Ohio, Michigan, and Indiana - Regional Wood In Transportation

Commercialization Projects

Montana, Yellowstone County

Regional Wood in Transportation Partnership ... *continued from page 5*

- Erie Basin RC&D, Ed McConoughey, Acting Coordinator
  220 Woodbine St.
  Willard, OH 44890
  Phone: 419-933-2166
- Headwaters RC&D, Eric Carlson
  650 Leonard Street
  Clearfield, PA 16830
  Phone: 814-765-4612
- Historic Hoosier Hill RC&D, Gary Conant
  P. O. Box 407
  Versailles, IN 47042
  Phone: 812-689-6456
- Michigan Department of Natural Resources, Jack Pilon
  P. O. Box 128
  Roscommon, MI 48653
  Phone: 517-275-5151
- Seneca Trails RC&D, Howard Schuster
  2 Park Square
  Franklinville, NY 14737
  Phone: 716-676-5111
- Timber Bridge Information Resource Center
  180 Canfield Street
  Morgantown, WV 26505
  Phone: 304-285-1591

Timber Bridge Monitoring Reports

The Forest Products Laboratory has recently completed three additional monitoring reports on modern timber bridges. The reports include information on field evaluations and track the performance of recently constructed modern timber bridges. Following is a brief description of each report.

Field Performance of Timber Bridges - 2. Cooper Creek Stress-Laminated Deck Bridge

The Cooper Creek bridge was constructed in February 1992, in Centerville, Iowa. The bridge is a two-span, continuous stress-laminated deck structure 42-feet long and approximately 26.5-feet wide. The bridge is constructed of eastern cottonwood.

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NEW PUBLICATIONS

Wood In Transportation Special Project Summary Report: Fiscal Years 1992 Through 1995

The Wood in Transportation Program, formerly the National Timber Bridge Initiative, began sponsoring special projects in 1992. Special projects are funded for several reasons, such as:

♦ To address the needs of broadening the Program into other wood in transportation applications; i.e., not limiting funding to vehicular timber bridges, but allocating some funds to other projects, such as timber binwalls.

♦ To demonstrate new technologies or methods for reducing transportation system costs.

♦ To study the markets and perceptions related to timber uses in transportation structures.

♦ To enable cooperators to initiative endeavors or implement strategies that would stimulate local, regional, or national economies.

This report is a synopsis of the 58 special projects that were funded from Fiscal Year 1992 through Fiscal Year 1995. It includes the key contact for each project, project description, and project status. For a copy of the report, contact the Timber Bridge Information Resource Center at 304-285-1591.

Timber Bridge Monitoring Reports

- *continued from page 6*

Field Performance of Timber Bridges - 3. Birchlog Run and Tumbling Rock Run Stress-Laminated Deck Bridge

The Birchlog Run and Tumbling Rock Run bridges were constructed in the summer of 1990 on the Monongahela National Forest in West Virginia. The bridges are simple span, single-lane, stress-laminated deck superstructures, and each bridge is approximately 30-feet long and 13-feet wide. The Birchlog Run bridge is constructed of southern pine lumber, and the Tumbling Rock Run bridge is constructed of northern red oak lumber.

Field Performance of Timber Bridges - 4. Graves Crossing Stress-Laminated Deck Bridge

The Graves Crossing bridge was constructed in October 1991 in Antrim County, Michigan. The Bridge is a two-span continuous, stress-laminated deck superstructure. It is 36-feet long and 26-feet wide. The bridge is constructed of red pine.

For copies of these reports, please contact the Timber Bridge Information Resource Center at 304-285-1591.

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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