CROSSINGS
NEWSLETTER OF THE WOOD IN TRANSPORTATION PROGRAM

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Design and Construction of the Pochuck Quagmire Bridge — A Suspension Timber Bridge on the Appalachian Trail, Vernon Valley, New Jersey

The USDA Forest Service's Wood In Transportation Program has been involved with many local timber bridge projects and partners during the last 10 years. One such project was the design and construction of a suspension timber bridge on the Appalachian Trial. Suspension bridges, like the Pochuck Quagmire Bridge, provide a solution to long-span crossings. The project resulted in the completion of a 146-foot-bridge in 1996 with material cost of $36,000. It was constructed by a unique volunteer-driven, public-private partnership between the NY-NJ Trail Conference, the New Jersey Department of Environmental Protection (NJDEP), the NY-NJ Trail Conference, NJ Appalachian Trail Management Committee/Appalachian Trail Conference, GPU Energy, Paul Bell, Conklin Associates, the USDI National Park Service, and the USDA Forest Service. The Pochuck Quagmire Bridge is located on the Appalachian Trail in Vernon Valley, New Jersey, and is a vital link in the Appalachian Trial.

The Appalachian Trail is a continuous, marked national or scenic trail meandering 2,160 miles from Georgia to Maine. More than 73 miles of it runs through New Jersey. In 1978, the Appalachian Trail Amendment of the National Trails System Act authorized the United States Department of the Interior to establish a 1,000-foot-wide protective corridor around the Trail for portions that are outside State or Federal land. The State of New Jersey eventually acquired a continuous protective trail corridor. Because of wetlands and river crossings, the Appalachian Trail departs from the corridor in two locations – Wallkill River and Pochuck

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Results of the 7th National Timber Bridge Student Design Competition

Fourteen teams of students from twelve universities across the United States and Canada matched wits to devise a better way to "cross the creek" during the Seventh National Timber Bridge Student Design Competition. Open to student chapters of the American Society of Civil Engineers (ASCE) and Forest Products Society (FPS), the competition was made possible by a grant from the USDA Forest Service, Wood In Transportation Program. The Southern Pine Council and Unit Structures, Inc., of Magnolia, AR provided additional financial support. 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 team designed, constructed, and tested their bridges on their home campus, then submitted documentation of their activities and results to a panel of judges for review. This year, for the second time, the competition was online via the Internet, as each team was required to post design drawings, test results, and project highlights on the Web at www.msrcd.org. To view details of competition results and to access each entry in its entirety, click on "1999 Competition Results."

In the **Performance Category**, the award for **Best Support Structure** went to the **University of New Hampshire ASCE Chapter**. The support structure consisted of two longitudinal laminated veneer lumber 2-inch by 8-inch prismatic beams supported at two interior points by a space truss with pre-stressed cable. **Second** and **third place** went to **Virginia Tech FPS** and **Lawrence Technological Institute (MI) ASCE**.

University of New Hampshire ASCE
Best Support Structure - First Place
Most Practical Design - First Place
Most Innovative Design - First Place

The **Performance Award** for **Best Deck** was captured by the **University of British Columbia FPS (Team 1)**. Their bridge was decked with a double layer of 1-inch by 4-inch spruce pine fir overlapping in a herring bone pattern. **Virginia Tech FPS** and **San Jose State University ASCE** placed **second** and **third**.

First place winner of the **Best Design Award** was the **University of Pittsburgh ASCE**. Their twin, circular arc, tapered arches of southern pine with segmented chords incorporated high-strength steel hangers supporting carbon-reinforced pine floor beams decked with 1- inch by 6-inch Radiotta pine planking. The entry also was awarded **second place** in both the **Most Aesthetic** and **Most Innovative Design**. Check it out at their website (www.pitt.edu/~mawst80). **Second** and **third place** in **Best Design** went to **Utah State University ASCE (Team 2)** and **San Jose State University ASCE.**

University of Pittsburgh ASCE
Best Design - First Place
Most Aesthetic Design - Second Place
Most Innovative Design - Second Place

University of New Hampshire ASCE's entry also won **first place** in **Most Practical Design**, with **second** and **third** going to **Utah State University ASCE (Team 2)** and **University of British Columbia FPS (Team 2)**.

Continued on page 4

7th National Timber . . . *continued from page 3*

Utah State University ASCE (Team 2) placed **first** in the **Most Aesthetic Design** category. Its twin hand-made glu-lam arches supported eight evenly spaced-engineered wood I-beams decked with 2-inch by 6-inch tongue-and-groove fir. **Second** and **third** place went to the **University of Pittsburgh ASCE** and **Oregon State ASCE.**

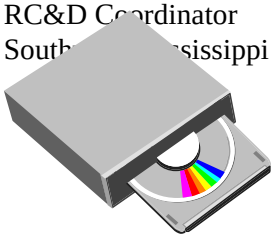
Utah State University ASCE
Most Aesthetic Design - First Place
Best Design - Second Place
Most Practical Design - Second Place

First place for **Most Innovative Design** was awarded to the **University of New Hampshire ASCE, University of Pittsburgh ASCE** placed **second,** and **San Jose State University ASCE** placed **third**. Other schools entering the competition were Mississippi State University, Ohio University, Clarkson University, University of North Carolina-Charlotte and Utah State University (Team 1).
The competition's objectives are 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 11-feet long and 5-feet wide and were loaded with a test weight of approximately 4,500 pounds. Average weight of the bridge models was 234 kg. At full loading, maximum bridge deflection ranged from 0.50 mm to 6.96 mm. Maximum allowable deflection was 8 mm. Net deck deflection averaged 0.91mm for the nine bridges that met the maximum allowable deflection of 2 mm. Percent non-wood materials in the bridges ranged from two percent to eighteen percent; maximum percent non-wood materials allowed was 25 percent by weight. A total of 118 students spent 4,255 hours on the competition, competing for $10,000 in prizes. Judges were Maurice Rhude, Sentinel Structures, Inc., Peshtigo, WI; Merv Eriksson, USDA Forest Service, Missoula, MT; and Dough Burgin, Southern Forest Products Association, Kenner, LA.

For additional information on the above referenced designs or for information in competition rules and instructions for tbe 2000 Competition, contact Southwest Mississippi RC&D, Inc., 747 Industrial Park Road, NE, Brookhaven, MS 39601. Phone: 601-833-5539, Fax: 601-835-0054, e-mail southwest@msrcd.org, or keep an eye on the website at www.msrcd.org. Rules for 2000 are due to be announced by mid-September 1999.

Bennie F. Hutchins
RC&D Coordinator
South[illegible]ssissippi RC&D, Inc.



The Nature of Wood and Wood Products CD-Rom

Would your career benefit from additional knowledge of the raw materials and products that you use, specify, and sell everyday? Might a more knowledgeable workforce improve product design and performance, customer relations, and profitability of your business? A revolutionary new CD-Rom is available that provides the basics of wood science and technology in a user-friendly, interactive format.

Fifteen individual study modules cover subjects including:

- Properties of softwoods
- Properties of hardwoods
- The formation and chemistry of wood
- Juvenile wood and reaction wood
- The influence of forestry practices on wood quality
- Wood drying

Continued on page 5

- Specific gravity of wood

***The Nature of Wood and Wood Products* CD-Rom . . .** *continued from page 4*

- Strength of wood
- Wood preservation
- Lumber
- Plywood
- Wood composite products
- Pulp and fiber products
- Measurement of wood products
- Raw materials and the environment

Authored by Dr. Jim L. Bowyer, Department of Wood and Paper Science, University of Minnesota, and Ruth L. Smith, President, WebSmith, Inc., this series of modules is designed to provide a basic understanding of wood as a material and of the principal products made of wood. What is the nature of wood? How do various types of wood differ? What properties do different kinds of woods have and why? How can wood products be modified so as to improve performance? What are the limitations to wood use? What are the fundamental characteristics of the principal wood products and essential features that define their proper application and use? How are wood products measured and what units are used in commercial trade? The answers to these questions and more are included within this series.

Each module includes a review that tests understanding of key concepts. Instant feedback is provided, along with links to review material that is relevant to any question that may have been answered incorrectly. Also, included in the series are over 700 photographs and graphics, animations, scroll bars for self-testing, and many other visually stimulating elements – all designed to promote understanding of the subject matter.

Check out the demo version of the Nature of Wood and Wood Products at http://www.forestprod.org.

To order your copy, please contact:

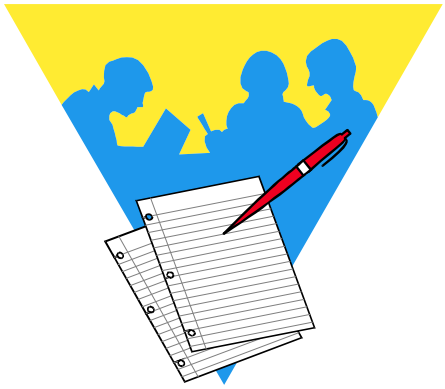
Forest Products Society
2801 Marshall Court
Madison, WI 53705-2295
Phone: 608-231-1361 ext. 202

Wood In Transportation Conference

A Wood In Transportation conference will be held on November 4-5, 1999, at the National Arbor Day Foundation's Lied Conference Center in Nebraska City, Nebraska. The conference will provide engineers and decision makers including the county, municipal, and state transportstion officials an opportunity to better understand wood and its attributes as a construction material. Forest product specialists, researches, and engineers utilizing timber bridge technology will present information and lead discussions about design specifications, performance results, cost analyses, and other specifics of this technology.

Two timber bridges will be used as demonstration sites during the conference. Designing engineers will lead walking tours of a pedestrian bridge in the Arbor Day Farm trail system and a vehicular bridge completed by Nebraska City on Steinhbart Road adjacent to the Farm. The vehicular bridge consists of 150-foot glulam arches and pedestrian walkways on either side.

For more information on the conference, call The National Arbor Day Foundation at 402-474-5655, Fax: 402-474-0820; write to P. O. Box 81415, Lincoln, NE 68501-1415; or e-mail to conferences@arborday.org. The National Arbor Day Foundation is a nonprofit education organization that helps people plant and care for trees.



Pochuck Quagmire Bridge . . . *continued from page 1*

Creek.
The construction of bridges over these two waterways to place the trail within the corridor is the number one priority of the Appalachian Trail project partners in

New Jersey.

To provide a trail corridor from Pochuck Mountain to Wawayanda Mountain, within Vernon Valley, the New Jersey State Park Service and the National Park Service acquired 141.1 acres between Sussex County Route 517 and Canal Road. The Appalachian Trail could not be placed practically within this trail corridor until the 60-foot-wide Pochuck Creek could be crossed safely by hikers. The creek is up to eight feet deep, with steep, slick clay banks, and a deceptive current. A 3,000-foot-wide floodplain wetland covers both sides of the creek. The wetland approach on either side of the creek is a quagmire into which a hiker can sink waist deep even during the dry summer months.

Before the Pochuck Bridge was built, hikers wishing to continue on the Appalachian Trail were forced to detour the quagmire by following a dangerous 2.1 mile roadwalk along heavily traveled county roadways with poor sight distances. The Pochuck Bridge project was initiated to address this problem. The primary goal of the project was to provide a safe, practical, cost-effective creek crossing that would place the Appalachian Trail within the corridor and eliminate the hazardous roadwalk. Phase 1 of the project was accomplished through the construction of the Pochuck Quagmire Pedestrian Suspension Bridge.

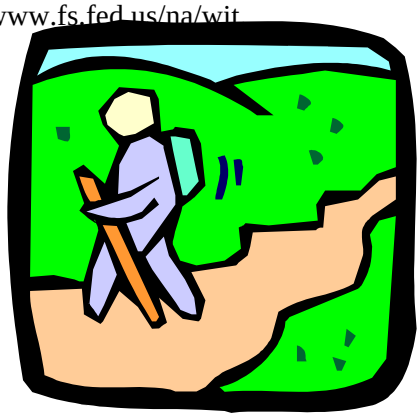
After lengthy discussions and pre-design work, the project partners selected a timber suspension bridge design for a variety of reasons. Many of the reasons were driven by location, site characteristics, cost, and volunteer work force. The final details of the completed bridge are as follow:

Dimension:	146 feet by 44 inches (110–foot center span) Bridge walkway complies with American With Disabilities Act
Materials Cost:	$35,836
Total Project Cost:	$98,400
Towers:	Class 1 southern pine transmission poles
Walkway:	#1 southern pine CCA.40 kiln-dried after preservative treatment
People-Hours:	5,239

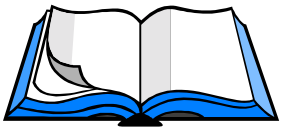
The USDA Forest Service and the project engineer recently completed a publication on the project. The purpose of the publication is to thoroughly document the design and construction of the bridge, as well as other important factors that are involved in a "volunteer-driven" project (such as liability issues and risk management).

Individuals and organizations that are considering the construction of a timber suspension bridge as well as those that have a significant "volunteer-driven" construction project will find this document very useful.

To obtain a copy of this publication, please contact the National Wood In Transportation Information Center at 304-285-1591 and ask for publication number WIT-02-0048. You can also order the publication from our website: www.fs.fed.us/na/wit



NEW PUBLICATIONS



Design and Construction of the Pochuck Quagmire Bridge - A Suspension Timber Bridge

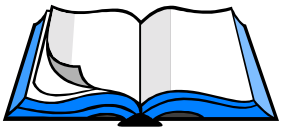
This publication documents one of more than 400 projects the Wood In Transportation program has funded throughout the country. It captures the partnerships developed, the trials and tribulations, and design and construction of a suspension bridge. This project was administered by the New-York-New Jersey Trail Conference and resulted in the construction of a suspension timber pedestrian bridge in the Appalachian Trail. The bridge is a critical link in the realignment of the Appalachian Trail to its designated trail corridor in the State of New Jersey.

To obtain a copy of this publication, please contact the National Wood In Transportation Information Center at 304-285-1591 and ask for publication number WIT-02-0048. You can also order the publication from our website: www.fs.fed.us/na/wit.

Inspection of Timber Bridges Using Stress Wave Timing Nondestructive Evaluation Tools: A Guide for Use and Interpretation

This guide was prepared to assist inspectors in the use of stress wave timing instruments and the various methods of locating and defining areas of decay in timber bridge members. The first two sections provide (a) background information regarding conventional methods to locate and measure decay in timber bridges and (b) the principles of stress wave nondestructive testing and its measurement techniques. The last section is a detailed description of how to apply the field use of stress wave nondestructive testing methods. A sample field data acquisition form and additional reference material are included in the Appendix. This guide includes all the information needed to begin to utilize and interpret results from stress wave timing nondestructive evaluation methods.

To obtain a copy of this publication, please contact the National Wood In Transportation Information Center at 304-285-1591 and ask for publication number WIT-03-0007. You can also order the publication from our website: www.fs.fed.us/na/wit.



Article contributions, questions or comments may be sent to Ed Cesa, Program Manager, 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 or FAX: 304-285-1564; or E-mail to cgrant/na_mo@fs.fed.us.

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