



# CROSSINGS

NEWSLETTER OF THE WOOD IN TRANSPORTATION PROGRAM



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## Timber Bridge at Cove Mountain Farm

### *History of Cove Mountain Farm*

Cove Mountain Farm lies 100 miles northwest of Washington, DC, near the town of Mercersberg in Franklin County, Pennsylvania. The farm encompasses about 330 acres, with 200 acres of open grassland and 100 acres of forests. Once owned by Anthony and Anya Smith, the Smith's made it possible for the farm to be left to a qualified organization for conservation and education purposes. In 1996, their property was deeded to the American Farmland Trust (AFT), a private non-profit membership organization founded in 1980 to help protect the nation's agricultural resources.

Cove Mountain Farm was used for hay production in recent years and had not carried livestock since the mid-1960's. After it assumed ownership, AFT committed funding to convert the farm into a state-of-the-art grass-based dairy. Today, the site is used by AFT to demonstrate the economic and environmental benefits of grass-based livestock management systems. The farm now has a New Zealand-style milking center, a series of improved cattle lanes, livestock watering units in every paddock, and it is completely fenced with high-tensile electric fencing.

### *Challenges for the Cove Mountain Farm*

Little Cove Creek runs through the center of the farm. It is normally a slow meandering creek approximately 35-40 feet wide. Several shallow crossings exist that are used by equipment and livestock. During storm events, however, the water can rise very quickly and may restrict crossing for several days.

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While this might not be an issue on most farms, having dairy cows on the opposite side of the creek from the milking parlor can be a real problem.



Cove Mountain Farm's developers had another concern. One of the primary reasons for undertaking this project was to demonstrate the environmental benefits of grass-based farming systems. Protecting the water quality of Little Cove Creek was and is an important part of the project. Grass farms use significantly less fertilizer and pesticides than conventionally run dairies. Also, because the animals are out on pasture and never confined, there is little concentration of manure and the need for storage and spreading is reduced. While these factors greatly reduce the potential for impacts to water quality, frequent cattle crossings can negatively impact water quality. An all-season crossing was needed.

To provide a reliable crossing, and to further protect the water quality of the creek, a bridge was included in the Cove Mountain development plan. In the fall of 1998, an improved low-water crossing was installed at a point on the creek where people and animals have always crossed. A site adjacent to the crossing was chosen for construction of a timber bridge in April 1999.

***The Timber Bridge at Cove Mountain Farm***

A timber bridge offered a low cost solution for this stream crossing. When properly designed, timber bridges are strong and durable and can be used for everything from highway bridges to livestock crossings.

Engineers from the USDA Forest Service designed a single lane/single span timber bridge for the Cove

Mountain Farm. It is 40 feet long and 12 feet wide, sufficient for cows and the occasional crossing of farm equipment. The design included three glulam beams manufactured from a combination of red maple and southern pine, with a deck made of 3-1/8 inch southern pine glulam panels. The unique beam design was developed to demonstrate the use of red maple (a Pennsylvania hardwood species) and southern pine in an attempt to provide an economical structure that incorporates locally grown timber.

A permit from the Department of Environmental Protection and several months of planning, design, and prefabrication were required before the installation could take place. The components arrived on a semi-truck and were unloaded near the construction site with a loader/backhoe. After the components had been unloaded, a 6 inch x 12 inch x 12 feet sill plate was placed on each side of the creek.



The sill plates were then squared and secured with bolts to bridge abutments made of steel wire gabion baskets filled with large crushed stone. Each abutment was 3 feet wide, 6 feet high and 24 feet long. Poured concrete could have been used as an acceptable alternative to the rock gabions.



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## Cove Mountain Farm . . . continued from page 2

With the sill plates in place and secured to the abutments, the main support beams or stringers were carried out by the loader/backhoe. These pieces were 5-1/8" wide x 26-1/8" tall x 40' long. The beams were attached to the sill plate with steel angles and bolts.



Three beams were required to meet the weight requirements of an H-10 design vehicle, which is a 10 ton, 2 axle truck. The design axle loads are 4,000 lbs. and 16,000 lbs. spaced 14 feet apart. This accommodates most small farm equipment and light truck traffic.



Next, the first glued-laminated deck panel was dropped into place with the loader. Successive panels were rolled into place using round steel bars. This method worked very well considering the weight of the panels, each measuring 3-1/8 inch x 4 feet x 12 feet.

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## Wood In Transportation Demonstration Projects Funded in Fiscal Year 2000

In January 2000, a national evaluation panel consisting of engineers and forest products technologists from the USDA Forest Service and Federal Highway Administration selected five projects for funding in federal fiscal year 2000. The primary focus of these projects is to continue to commercialize proven technology by designing, fabricating, and installing the most 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 Knox County, OH:

The Knox County Engineer's Office will receive \$100,742 for the construction of two stress-laminated southern pine timber bridges and for the redecking of an existing four span steel beam bridge. The first stress-laminated bridge is a single span, 26 feet long and 26 feet wide. The second stress-laminated bridge is two spans, 52 feet long and 26 feet wide. Both bridges will be designed to AASHTO HS-20 design specifications. Preservative treatment for all three structures will be alkaline copper quat. Each structure will include an asphalt surface over a geotextile membrane.

### Commercialization project in Etowah and Randolph Counties, AL:

The Coosa Valley Resource Conservation and Development Area will receive \$77,200 for the construction of two modern timber bridges. This project will replace two existing bridges using southern pine glued-laminated beams with glued-laminated deck panels. The bridges will be 52 feet in length and 28 feet 6 inches in width. The bridges will be designed to AASHTO HS-20 design specifications. Preservative treatment will be creosote. Each bridge will include an asphalt surface over a geotextile membrane.

### Commercialization project in West Virginia:

The WV Division of Highways will receive \$100,000 for the construction of eleven bridges. The bridges will be approximately 20 feet long by 16 feet wide using

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**Demonstration Projects Funded . . . continued from page 3**

southern pine and/or red oak lumber. Three designs will be used: steel beams supporting transverse nail-laminated lumber decks, steel stringers with timber plank decks, and stress-laminated 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.

Special project in Michigan: The Huron Pine Resource Conservation and Development Council will receive \$10,000 to form a task force that will:

1. consolidate existing and currently developing technical information about treated timber product use and their effects on the environment;
2. develop pre-approved design criteria and special provisions for treated timber structures, specific to Michigan and provide them to MI Department of Transportation, bridge engineers and county road commissions;
3. develop and provide to MI Department of Environmental Quality, internal policy guidelines, for adoption and use by permitting agents, to evaluate permit applications involving treated timber bridges.

Pedestrian bridge project in Wasatch County, UT: The Wasatch County Economic Development Office will receive \$37,000 to construct a pedestrian bridge. The design will be glued-laminated beams with glued-laminated deck panels. The beams will be a combination of Douglas-fir lumber and fiber reinforced polymers. The deck panels will be ponderosa pine. Preservative treatment will be pentachlorophenol. This bridge will be part of a larger project to construct a paved, non-motorized trail that connects the towns of Heber and Midway, Utah, and also connects to the Wasatch State park and the Nordic Venue for the 20002 Olympics.

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

— **Ed Cesa**  
**Program Coordinator**  
**Wood In Transportation Program**  
**USDA Forest Service**

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Holes to nail down the panels were predrilled at the factory. Ten inch deformed shank spikes were used to secure the panels to the beams.



When all the panels had been secured, end walls were attached to each end of the bridge. From start to finish, a relatively inexperienced six man crew was able to complete the job in about 24 hours.



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## Cove Mountain Farm . . . continued from page 4

Approach ramps were built using local shale. Finishing touches included the installation of a curb and curb blocks. A large quantity of riprap was also used on the downstream approaches and underneath the bridge structure to secure the banks.



The bridge was built primarily for cattle and they began using the bridge pretty much on their own. One day when the herd was on the other side of the stream, the low water crossing was blocked off and the bridge approaches left open. Almost all the cows crossed without any coaxing that first day. Since then, the herd crosses Little Cove Creek using the timber bridge without much difficulty.

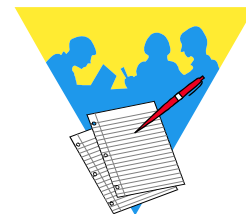
During the last five years, Pennsylvania has had an active timber bridge program that focuses on using hardwood timber grown in the state. These activities are being facilitated by the Pennsylvania Rural Development Council's Timber Bridge Working Group. The working group includes members from the Pennsylvania Department of Transportation, the Pennsylvania Department of Conservation and Natural Resources, the Pennsylvania Department of Agriculture, the Pennsylvania State University, consulting engineers, private industry, and USDA Forest Service. The group meets quarterly to address issues and discuss timber design and construction activities. The communication fostered during these meetings has assisted in the successful construction of more than 10 modern timber bridges completed in the state during the last five years using local timber resources.

AFT's total cost for the bridge was about \$26,000. This is about \$650 per running foot for the 40'x12' bridge. The earlier estimates for other bridge materials ranged from \$40,000 - \$80,000. Timber bridges are a viable alternative for landowners seeking affordable stream crossings.



— **Bryan Petrucci**  
**American Farmland Trust**

— **Ed Cesa**  
**USDA Forest Service**



## Update on Wood In Transportation Conference

The last issue of *Crossings* announced a national Wood In Transportation Conference planned for September 25-27, 2000 at the Holiday Inn Conference Center in Grantville, PA. Due to unplanned circumstances, this conference has been postponed indefinitely.

## NEW PUBLICATIONS

### **Glued Laminated Timber Bridge Systems: A Manual to Assist in the Design of Glued Laminated Timber Bridges**

This document provides design data, examples and recommendations for the use of preservatively treated glued laminated timber in the construction of vehicular and pedestrian bridges. It addresses three types of bridges:

1. Longitudinal deck bridges,
2. Longitudinal stringer with transverse deck bridges,
3. Longitudinal stress-laminated girder bridges.

For a copy of this publication, contact:

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The American Institute of Timber Construction (AITC) is the national technical trade association of the structural glued laminated (glulam) timber industry. AITC represents a majority of the glued laminated timber manufacturers in the U.S. in addition to a number of installers, suppliers, sales representatives, engineers, architects, designers, and researchers.

Since 1952, the AITC has had one name and one focus - structural glued laminated timber. Utilizing the professional talents and extensive experience of

its membership base, AITC developed, sponsored and continues to maintain the American National Standard for Structural Glued Laminated Timber - ANSI/AITC A190.1.



### **Standard Plans for Glulam Timber Pedestrian Bridges**

The development of standardized pedestrian timber bridge plans and specifications is a key element in improving design and construction practices. The bridge plans presented were developed as a cooperative effort between the USDA Forest Service, Wood In Transportation program; the Pennsylvania Department of Conservation and Natural Resources; the Pennsylvania Rural Development Council; and Powers & Schram Inc., Consulting Engineers. This publication contains standardized designs and details for two timber bridge superstructure types, including longitudinal glued-laminated timber stringer bridges with transverse timber decks, and longitudinal glulam panel bridges. The set of standards encompasses numerous span length and width combinations, design loads for an AASHTO H-10 vehicle, and pedestrian live loads. Timber species include red maple, southern pine, and Douglas-fir.

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-02-0049. You can also order the publication from our website at [www.fs.fed.us/na/wit](http://www.fs.fed.us/na/wit).

*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; E-mail to [cgrant/na\\_mo@fs.fed.us](mailto:cgrant/na_mo@fs.fed.us) or website at [www.fs.fed.us/na/wit](http://www.fs.fed.us/na/wit).*

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