TBIRC
Timber Bridge Information Resource Center

# CROSSINGS

NEWSLETTER OF THE NATIONAL TIMBER BRIDGE INITIATIVE

*Editor - Tinathan Coger* *Issue 10* *November 1992*

## Bear Creek Bridge Completed

A unique gluelam bridge has been constructed over Bear Creek Run, Elk County, on Allegheny National Forest, according to Acting Forest Supervisor Ted Beauvais.

The Forest Service recently completed construction of a unique timber bridge crossing Bear Creek on Forest Road 135, between Ridgway and Owl's Nest in Elk County Pennsylvania. Construction of the Bear Creek Bridge represents the first application of glue-laminated (gluelam) red maple hardwood for bridge deck and railings. Gluelam timber is made by binding together small-dimension, sawn lumber with waterproof adhesives into the large beams and timbers needed for bridge construction.

To date, the use of hardwoods in bridge construction has been very limited; most timber bridges are constructed of Douglas fir or Southern pine. The US Forest Service has been involved in developing methods to utilize local hardwood species such as beech,

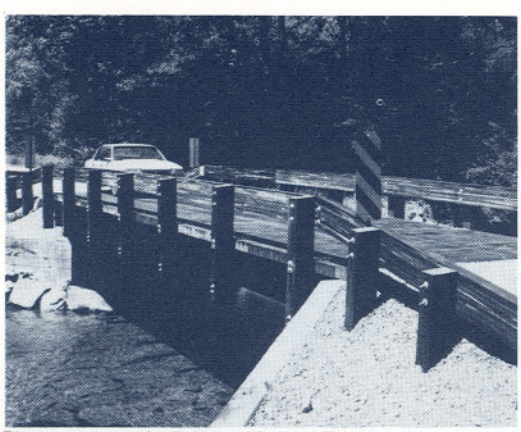

Photo courtesy of Allegheny National Forest

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## Survey Results

Included in Issue 7 of *Crossings* was a postcard requesting readers identify topics that they would like to see reviewed in future issues of *Crossings*. Several hundred cards have been returned and following is a summary of the survey. We at the Timber Bridge Information Resource Center will do our best to address these issues in future articles.

**Timber Bridges**
- Wood Bridges types and designs
- Timber deck replacement for other bridge types
- Portable bridges
- Longspan bridges
- Grading standards. (Hardwoods)
- AASHTO updates

**Timber Bridge Abutments and Support Structures.**
- Bridge Abutments and Anchor Systems
- Footings other than Piles, bents, and Cribs
- Timber Pilings

**Environmental Issues**
- Environmental Impacts; Water Quality
- Projected Life through Treatments / Causes of Decay
- Wood Preservation
  - Water born Salt Preservation
  - Wood Preservation
  - EPA-TCLP Sampling and Test for Tropics
  - Safety Issues in Treatment

**Timber Bridge Guardrails**
- AASHTO and FHwA Approved Timber Barrier Rails
- Crash Testing

**Current Research Projects**
- Evaluation and Load Rating of Existing Glulam Bridges
- Live Load Distribution
- Red Maple Research
- Monitoring / Testing

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## Bear Creek ... *continued from page 1*

maple, and oak for structural purposes like bridge building.

The Forest Service, PennDOT, and the Pennsylvania State University, are involved in research to develop hardwood gluelam bridge standards: laminating procedures, preservative treatments, adhesive systems, and allowable stresses. The Bear Creek Bridge demonstrates that local hardwoods are a viable option for bridge construction today.

Eastern hardwood timber has a number of advantages in bridge construction. It is a renewable resource, and there is an abundance of low-grade hardwood in Pennsylvania that can be put to economical use. Use of local resources benefits the local economy and saves transportation costs.

The natural warmth and beauty of wood are especially fitting in a rural or forest setting. Modern timber bridges are treated with preservatives and need little or no maintenance to insure a long life; no painting is required.

The Bear Creek Bridge uses red maple gluelam deck panels 15 feet long, four feet wide, and 5-1/2 inches thick, along with gluelam posts and railings. These are supported by 50-foot, COR-TEN weathering steel stringers.

The bridge was designed by Allegheny National Forest engineer Greg Porter, and constructed by M&M Contractors, Johnsonburg, Pennsylvania.

— **Nancy Schuler**
Allegheny National Forest

## INDIAN CREEK BRIDGE REPLACEMENT PROJECT

Indian Creek Bridge Replacement Project was jointly funded by the Federal Highway Administration and Clallam County. The contract to replace the bridge was awarded to Del Hur Industries of Port Angeles at their bid price of $217,900. Modifications in the scope of reconstruction of the bridge approaches reduced the final cost of the project to $207,883. Total cost of the bridge was $158,878 including surfacing.

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## World's Longest Clear-span Timber Highway Bridge

This dramatic bridge utilizes two 154-foot high reinforced concrete Gothic arch towers. Each tower supports twelve 1-7/8" diameter wire rope cables for the stayed suspension system that carries thirteen parallel chord truss bridge sections. The 469-foot long bridge has a 253-foot center span and two 108-foot approach spans. The beautiful 16-foot wide bridge was installed during June and July, just in time for the airport dedication in September, 1992.

Nippon Express, Tokyo, had the subcontract to reassemble and lift the thirteen timber bridge sections into place, which was accomplished under the direction of their project manager, Syuntaro Takahashi.

Each parallel chord truss has 8-3/4" x 24" glulam top chords and 8-3/4" x 27" glulam bottom chords. All web members are 8-3/4" x 9" glulams. Longitudinal 6-3/4" x 48" glulam panels, supported on steel floor beams at 9-foot centers, comprise the bridge deck. The glulam deck surfaces are protected with a compacted geotextile fabric and an asphalt pavement wear surface. The timber bridge system will have a long service life due to the pressure treatment of gluelaminated beams and all hot-dipped galvanized metal connections.

The 210,000 FBM of glulam bridge components were manufactured by the Weyerhaeuser Company in Cottage Grove, OR, and pressure treated by Niedermeyer-Martin of Ridgefield, WA. Richardson Metal Works, Vancouver, WA., furnished 140,000 lbs. of fabricated steel shapes; while Northwest Bolt, Seattle, WA, supplied 30,000 lbs. of connecting hardware.

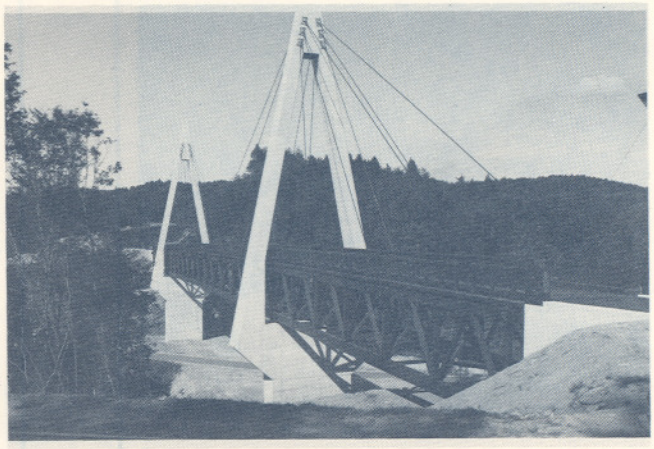

Photo courtesy of Matthews Associates, Inc.

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## Indian Creek ... *continued from page 2*

The old Indian Creek bridge was constructed of log stringers supported on log cribbing abutments. The decking was 4" x 12" planking nailed to the log stringers. None of the timber was pressure treated. Deterioration of the log cribbing abutments resulted in several inches of settlement at each end of the structure. Deterioration of the log stringers reduced the cross section of the stringers resulting in a reduction of the load capacity of the bridge to three tons.

Lake Aldwell road, of which the Indian Creek bridge is a part, serves as the only access to a County park and the public boat launching ramp on Lake Aldwell. The road is the only access to hundreds of acres of private timberlands. The desire was to replace the old bridge with a structure that would combine the length, width, and load capacity with minimal environmental impact using simplified construction techniques for long term maintenance.

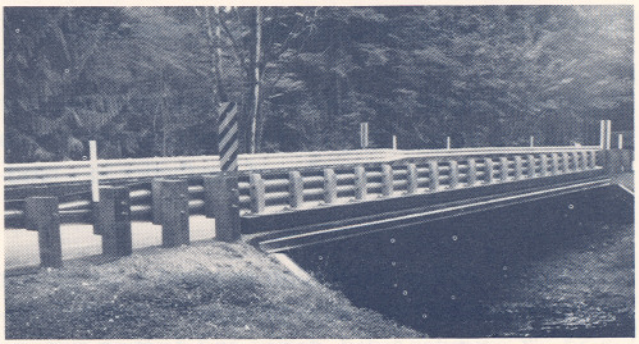
The bridge material chosen for replacement of this structure was glued laminated timber for several reasons.

**Interest in the local economy.** Clallam County's major industries are timber related and most are experiencing economic hardships because of cutbacks in allowable timber harvests.

**Weight of major structural components.** The weight of major structural components laminated from timber is significantly less than similar structural components cast of other materials. A larger number of local contractors would have access to equipment with enough capacity to handle the timber members.

**Simplicity.** The design of timber structures is simple, and straightforward.

The new bridge was designed to have a load rating of HS-20+, a length of 60 feet, and a deck width of 32' providing a road width of 28'. Each detail of the structure was designed to be as simple and redundant as possible. For example, all deck panels are identical and are detailed symmetrically about both the lateral and longitudinal center-lines. This reduced the possibility of dimensional errors when the panels are manufactured, and allowed the panels to be assembled on the beams upside down, backwards, or end to end.



Indian Creek Modern Timber Bridge
Photo Courtesy of Clallam County Road Dept.

Efforts were made to preserve the long term integrity of the structure, through several design features intended to prevent moisture from reaching the pressure treated members after assembly. Deck edge flashing was incorporated to protect the normally exposed end grain of the deck panels. A waterproof membrane was laminated between the deck and the asphalt concrete pavement wearing surface, and a corrugated aluminum end wall plate was incorporated between the glue-laminated endwalls and the road approach backfill.

The new bridge turned out as expected. Its clean, simple lines blend well with the enviornment. Clallam County is confident that the design and materials incorporated into this structure will extend the useful life well into the 21st century.

— **Ross Tyler, Engineer**
Clallam County Road Department
Port Angeles, WA

## World's Longest ... *continued from page 2*

The RLD Company, Vancouver, Wash., laid out and fabricated the glulam truss sections, and actually assembled two complete sections for inspection and approval by representatives of the Japanese owners. After pressure treatment, components for each bridge section were loaded onto 40-foot flat rack containers for shipment to Japan.

"Wood has become a popular material for major construction in Japan," says Chuck Schmokel, Bridge Design and Sales Director for Western Wood Structures.

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## World's Longest ... *continued from page 1*

"Japanese designers are looking for new ideas and new architectural looks. They have a long association with wood and appreciate the value of aesthetics in a product."

"The timber bridge fabrication required a far greater degree of precision than most projects, "Schmokel continued. "Computer aided design and drafting systems were employed to prepare the detailed drawings that would ensure a perfect fit for the prefabricated wood and steel parts."

Schmokel stressed that the Japanese were very particular. For this reason, Mitsui Wood Products supplied an exact model of the bridge, which was tested at the University of Tokyo wind tunnel. To further insure that there were no structural design flaws, the university also performed full-size structural tests on selected timber and steel connections.

Although the largest, this is not the first timber bridge Western Wood Structures has supplied to Mitsui Wood Products. Currently, four additional bridges are under design or being fabricated for vehicular or pedestrian use. Western Wood Structures has also supplied timber bridges to customers in Saudi Arabia, Canada, and 35 states in the United States.

"We hope the Hiroshima bridge design will be an inspiration to government officials in our country," says Turner. "The current U.S. Forest Service appropriations bill provides special funds for states and counties to purchase timber bridges featuring innovative designs. We hope officials will turn to us so we can help them achieve the enhanced aesthetics represented by this grand entrance to Hiroshima Airport."

For more information about this bridge, contact Chuck Schmokel, Western Wood Structures, Inc., P.O.Box 130, Tualatin, OR 97062; 800-547-5411; FAX: 503-692-6434.

— Dean Matthews
Matthews Associates, Inc.
Seattle, WA

## Survey Results ... *continued from page 1*

**Trail Bridges and Pedestrian Bridges**
- General Information

**Timber Bridge Information**
- Cost Data / Life Cycle Cost
- Location of Demonstration Bridges with Positive and Negative Information

**Timber Bridge Maintenance**
- General
- Rehabilitation of Current Bridges
- Restoring Historical Bridges
- Inspection (Visual)

**Construction**
- General Methodology
- Specifications for Materials

**Portable Timber Bridges**
- Bridges for Logging Roads

**List of Contractors, Manufactures, Fabricators and Treators**

**Protection of Timber Bridge Surfaces**
- Rubber Membranes on Treated Wood
- Surface Types

**Timber Culverts**

**Other**
- Workshop Information
- Other Funding Sources (State, Local, Grants)
- Marketing of Timber Bridges
- Acid Rain
- Wooden Noise Barriers

*Article contributions, questions or comments may be sent to Stephen C. Quintana, Program Director, P.E. 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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