

NATIONAL STEEL BRIDGE ALLIANCE

## 2001 Prize Bridge Award

merit award: SPECIAL PURPOSE

# Harlequin Bridge

North Cascades National Park,  
Stehekin, WA

In 1997, the Federal Highway Administration (FHWA) identified the existing Harlequin Bridge as a candidate for rehabilitation or reconstruction. This treated timber Baltimore truss bridge was built in 1948. After nearly 50 years in service, the bridge's timbers were severely cracked and splintered, and inspectors noted isolated pockets of decay. An in-depth inspection in August of 1997 revealed that one of the top chord members had failed in compression. Park Service maintenance crews installed an emergency repair, but it was clear that rehabilitation was no longer an option; the bridge would have to be replaced.

The Harlequin Bridge was located in the Stehekin Unit of North Cascades National Park. While there are more than thirty miles of road in Stehekin, this unit can only be accessed by a ferry, barge, boat, or float plane ride 55 miles up-lake from Chelan, WA. All material for construction, including machinery and equipment, would need to be transported by barge, an all day trip for each load, and then wind 4 1/2 miles up a single lane road to the bridge site.

The original 110' timber truss bridge needed to be lengthened to 165' to solve scour problems. This fact combined with the remoteness of the site and erection issues resulted in a steel through truss as the ideal choice. Weathered steel was selected to maintain the historical character of the old bridge by replicating the old bridge's timber look. Various structure types were considered including a through girder with the deck suspended between two massive steel girders, but all had some fatal flaw.





An engineering consultant was contracted to assist in preparing design visualization sketches to convey the concept to the park. The replacement bridge was to be a one-lane, six-panel Warren truss bridge made from unpainted weathering steel. Glue laminated timber deck panels and bridge rail were chosen to complement the texture and feel of the truss.

The engineering consultant designed the main truss elements as built-up box sections to resemble the sawn timber members of the existing bridge. Connection details were chosen to minimize areas where dirt and moisture could get trapped on the truss. Steel pipe piles were driven to provide bearing below the scour depth.

Constructing the bridge was truly a team effort, with significant contributions from all parties involved. Strider devised an ingenious method of supporting the truss panel points while the bridge was erected involving a set of tripods resembling giant jack-stands. The legs were weighted and adjustable to allow them to be set in the strong flow of the Stehekin River. Universal Structural provided material fabricated to exact dimensional specifications for a perfect fit-up. National Park Service personnel worked closely with WFLHD to provide logistical support. Even the local residents got into the act. Many of them became temporary employees of the contractor, and all of them joined in the dedication ceremony and parade on October 13, 2000.

**Owner**

National Park Service, North Cascades  
National Park, Sedro-Wooley, WA

**Structural Engineer**

Parsons Brinkerhoff Quade and Douglas, Inc.,  
Portland, OR

**Steel Fabricator**

Universal Structural, Inc., Vancouver, WA  
(AISC member)

**General Contractor**

Strider Construction Company, Inc.,  
Bellingham, WA

**Consultant**

Western Federal Lands Highway Division,  
Vancouver, WA

**Software**

GT Strudl