Donora – Webster Bridge

2010 photo of the Donora-Webster Bridge

Detail of pinned connection on lower chord of bridge.

Photography Credits:
Donora Historical Society, Donora, Pennsylvania
Jesse A. Belfast

Description

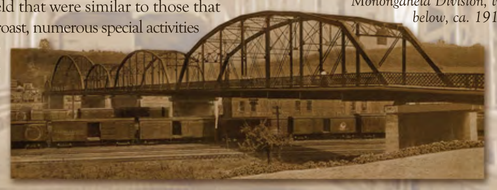
Built jointly by Washington and Westmoreland counties in 1908, the 14-span Donora Webster Bridge was 1,531 feet long and was comprised of 5 truss spans and 9 girder and slab approach spans. The main river span was a 515-foot Pennsylvania Petit truss, and the other four trusses were Parker type spans. Three of the Parker trusses (Donora side) were 184 feet long, and the fourth Parker truss (Webster side) was 207 feet long. The trusses were constructed of prefabricated structural members, including loop-welded and die-forged eyebars and riveted channels with lacing bars and plates, which were erected on site using pinned connections. The river spans rested on stone piers, while the land spans rested on poured concrete piers with stone caps.

History

The Donora-Webster Bridge was the first toll-free span across the Monongahela River. In 1905, a petition was passed for the bridge by Washington and Westmoreland counties, and Washington County Engineer, William Wylie, was commissioned to prepare plans. County courts approved bonds for the $200,000 structure in January 1907, and bids were received in November 1907. In January 1908, county commissioners selected the Toledo-Massillon Bridge Company (Toledo, Ohio) to construct the bridge's five trusses, and ground was broken for the bridge piers on March 24, 1908. The Dravo Contracting Company (Pittsburgh, Pennsylvania) constructed the bridge piers and concrete components, and Dunseath & Son Company (New York, New York) was responsible for steel erection. The bridge was constructed in record time, and its opening ceremonies were held on December 5, 1908. Minor work continued for several additional weeks, and the bridge was officially accepted by the counties on February 18, 1909. The bridge remained under the control of the counties until 1961, when it was taken over by the Pennsylvania Department of Transportation. The state performed major bridge rehabilitations in the mid-1960s and in 1986. After the 1986 rehabilitation, reopening ceremonies were held that were similar to those that occurred in 1908, including two parades, an ox roast, numerous special activities by local lodges, fraternal organizations, and fire departments. A couple was married on the bridge during the 1908 opening, and similarly two couples had their wedding vows renewed on the bridge as part of the bridge's centennial celebration in 2008.

Bridge Committee in 1908

Two photographs above show the construction of the Pennsylvania Truss main span in 1908.

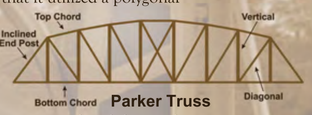


Donora side of Donora-Webster Bridge with Pennsylvania Railroad, Monongahela Division, tracks below, ca. 1910.

TRUSS TECHNOLOGY

Parker Truss

The Charles H. Parker received a patent on February 22, 1870, for a truss design that was very similar to the earlier Pratt truss (1842), except that it utilized a polygonal top chord. Parker recognized that the depth (height) of trusses required at the span ends is less that that required at mid-span, thus he designed a polygonal top chord that used progressively shorter vertical and diagonal members going from mid-span to span end. Parker's patent also incorporated the use of simple, cast iron connections between vertical and diagonal members and the upper and lower chords and he devised a method for accommodating minor changes in bridge length by varying the configuration of the inclined end posts. The advantage of Parker's use of a polygonal top chord was that it used less material than a comparable Pratt truss with a flat upper chord. The Parker truss did involve greater fabrication and erection costs because it required different length verticals and diagonals at each panel; however, bridge costs in the late nineteenth and early twentieth centuries were driven more by the weight of materials than fabrication and erection costs, especially for longer span bridges. Thus the Parker truss resulted in greater economy over the previous Pratt designs. Pratt trusses tended to be used for shorter span bridges ranging from 25 to 150 feet, whereas Parker thru trusses were commonly used for spans ranging from 100 to 300 feet.

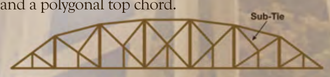


Parker Truss

Bridge during construction

Pennsylvania Truss

The Pennsylvania truss (also called a Petit truss) was developed by engineers of the Pennsylvania Railroad in 1875 for use in relatively long-span railroad bridges. The truss is a variation of the Parker truss featuring subdivided panels and a polygonal top chord. The Pennsylvania truss is similar to the earlier Baltimore truss, developed by the B&O Railroad in 1871, except that the Baltimore truss has a flat top chord. The innovative use of subdivided panels used in both of these truss types grew out of the desire to maintain an economic spacing of floor beams in long-span bridges. In order to maintain optimum slope of diagonals (45-60 degrees) and an economic spacing of floor beams, the panels were subdivided at intermediate points between the main vertical members with a sub-tie. This increases the number of floor beams but reduces the overall cost and weight of the bridge because the whole deck system can be designed with smaller members. The Pennsylvania Truss was adapted to highway use as early as the 1880s. Pennsylvania trusses typically ranged from 250 to 600 feet. The Donora-Webster Bridge, with a main span of 515 feet, was considered a particularly long example of this truss type.



Pennsylvania (Petit) Truss

Photographic composite of the Donora-Webster Bridge celebration on Opening Day, December 5, 1908. "The Donora American" newspaper documented the history and details of the grand opening of the bridge.