

Through Girder Bridges in Chester County

Built-up plate girder bridges, most often referred to as plate girder bridges, are “composed of rivet-connected plates for the web and angles for the flanges to make an I-beam section” (“History and Significance of Bridge Building Technology in Pennsylvania from the Earliest Days until 1956”, p. 16). There are several types of plate girder bridges, the two most popular being the through girder and the deck girder. The through girder bridge is one in which “the floor beams of the bridge are placed in line with the bottom flange [sic] of a pair of girders with the roadway passing between the paired girders” (Ibid.). A deck girder bridge is one in which “the floor beams are placed near the top flanges of the girders and the roadway [is] located at the top of the girders” (Ibid.).

Plate girder bridges were originally constructed by the railroads starting in the mid-Nineteenth Century as an inexpensive way to carry their rail lines over creeks and roads. This type of bridge was built with no aesthetic considerations, instead, it was built strictly for practicality; it was an attempt to find a stronger substitute for wooden bridges while being less expensive to build than masonry bridges. Plate girder bridges were developed at the same time as other metal bridges including metal truss and metal arch bridges; but because of their simple, plain, unadorned design, they tended to be less expensive than even the simplest metal truss or arch bridge to construct. By about 1890, the convenience and cost-effectiveness of building plate girders and their reputation for stability and longevity had been recognized by road builders who began to construct them to carry roads over streams and railroad tracks. Because of their continued popularity, plate girder bridges continued to be constructed for both railroads and roads through the 1930s.

Through girder bridges, the most popular type of plate girder bridge, began to be constructed in Chester County, Pennsylvania in the 1850s for use by railroads. Originally, these bridges were constructed of iron. As steel manufacturing technology advanced, through girder bridges began to be constructed of steel rather than iron. Starting in the 1890s, steel through girder bridges began to be constructed for road use. Once this type of bridge began to be used for roads, its popularity took off. By the early 1900s, steel through girder bridges were the favored bridge type for roads and they were constructed throughout the county through the 1930s. As road bridge technology continued to advance, steel girders were replaced with concrete girders, so that by the mid-Twentieth Century, through girder bridges were being constructed of concrete. By the 1940s, road bridge construction technology had changed to more modern systems using reinforced and pressed concrete.

It is not known how many through girder bridges were actually constructed in Chester County throughout the time period of c. 1850 through c. 1930. As far as can be told, no surveys or inventories were conducted of the bridges of Chester County until the late Twentieth Century when two state-wide surveys were completed, one in the 1980s and one in the mid-1990s. For purposes of comparison, therefore, the latest survey, known as the Lichtenstein Survey¹, was used as the source material for information about the extant through girder bridges in the county. Hundreds of through girder bridges were built in their heyday; however, one thing the survey makes clear is that many of these hundreds of bridges had disappeared by 1998, when the survey was completed. According to the survey, by 1998, only 31 bridges of typical through girder design were left in Chester County². Thirty of these bridges were dated from 1899 to 1932 with one modern through girder bridge constructed in 1971. This time frame has been divided into three periods, the early period, 1899 to 1910; the middle period, 1911 to 1921; and the late period, 1922 to 1932. Ten of these bridges were built in the early period of through girder road bridge construction, eight were built in the middle period of through girder road bridge construction, and twelve were built in the late period of through girder road bridge construction. The bridges from the early period are scattered all over the county with one bridge in each of the following townships: Elk, New London, East Fallowfield, Sadsbury, Honeybrook, South Coventry, Tredyffrin, Thornbury, West Goshen, and

¹A. G. Lichtenstein and Associates was hired by the Pennsylvania Department of Transportation (PennDot) to conduct the state-wide survey. This survey was conducted county by county in 1996-1998 and included bridges owned by the Commonwealth of Pennsylvania, county governments, municipal governments, and other owners such as the Pennsylvania Railroad.

²The Lichtenstein survey identified 35 extant through girder bridges; however, four of the bridges have been left out of this comparison either because they are not typical through girders (which is the case for three of them) or because they were replaced before the survey was completed (in the case of one of the bridges).

Kennett. Of these bridges, two (the Glen Rose Road Bridge in East Fallowfield Township and the Valley Forge Bridge in Tredyffrin Township) were replaced with modern bridges after the survey was completed and two have been altered, the Media Road Bridge in Elk Township had a new deck inserted into the structure of the bridge in 1950 and the Cambridge Road Bridge in Honeybrook Township had welded rolled floor beams inserted between the original riveted rolled floor beams and the concrete deck was replaced with an open steel grid deck in 1971. While the remaining six bridges have good to excellent integrity, two have had minor changes made to them, including the replacement of bolts with welds (the Lewisville-New London Road Bridge in New London Township) and the addition of curbs to the inside girders (the Thornton Road Bridge in Thornbury Township), and two of them are components of bridges comprised of multiple spans (the Newport Road Bridge in Sadsbury Township and the Eachus Mill Road Bridge in West Goshen Township). Only two of these bridges are single-span bridges comprised of one through girder bridge that also exhibit high integrity. These bridges are the Mount Pleasant Road Bridge in South Coventry Township which is a 50-foot long bridge supported on stone abutments and wingwalls with stone parapets. This bridge was constructed in 1904 by the County of Chester. And the second bridge is the Chandler Mill Bridge in Kennett Township which is a 47-foot long bridge with steel floor beams and a concrete deck supported on stone abutments and wingwalls with stone parapets. The Hadfield Creamery Bridge on Hadfield Road in East Brandywine Township is one of the mid period bridges, has excellent integrity, and is virtually identical to the Chandler Mill Bridge. This bridge was constructed in 1913 by the County of Chester. It was laid out and designed by Chester County Engineer Nathan R. Rambo and constructed by Dunleavy Bros., private contractor. This bridge was designed to meet very specific site needs which it has met admirably for approximately 100 years.

Hadfield Creamery Bridge was laid-out and designed by Nathan R. Rambo. Nathan Rambo was born in 1869 in the village of Eagle in Uwchlan Township. He attended the Windsor School in that township before moving to West Chester with his family in 1875. He completed his education in the public schools of West Chester in the mid-1880s (Daily Local News, March 26, 1952). After he finished his public schooling, he began his training as a surveyor with Walter A. MacDonald, County Surveyor. The office of County Surveyor was created by the County of Chester in 1850. The law that established the office called for the election of a trained practical surveyor every three years. The office of County Surveyor replaced the position of deputies to the Surveyor General (American Republican, April 30, 1850). The terms "Surveyor" and "Engineer" appear to have been used interchangeably throughout this time period.

By 1889, Nathan Rambo had surveyed and mapped the Borough of Malvern which was incorporated in August of that year (Daily Local News, March 26, 1952). By 1903, he had been appointed as the Surveyor for the Borough of West Chester. In that year, he completed four maps for West Chester showing the location, size, and length of all the sewer lines in the borough as well as the location of each inlet tap and connection for all the sewer lines (Daily Local News, October 24, 1903). These maps are still in use today because of their accuracy. In the same year, Rambo surveyed and located the Waynesborough trolley line (Daily Local News, April 19, 1904).

County Surveyor Walter A. MacDonald died in office in 1904, so Nathan Rambo, who had become his right hand man and chief assistant, was appointed to fill out the rest of MacDonald's term. Rambo was then elected as County Surveyor at the next general election (West Chester Star, May 30, 1914). As County Surveyor he planned and built 85 bridges throughout the county (Daily Local News, March 26, 1952), most of these bridges list him on their plaques as "County Engineer". Rambo favored stone arch and steel through girder bridges at a time when metal truss bridges were being championed by other local engineers.

In addition to his other responsibilities, Rambo also trained twenty young men to become surveyors (Daily Local News, March 26, 1952). Rambo continued as County Surveyor, successfully running for re-election five times, until 1919. In that year, the Office of County Engineer was established by the County Commissioners. The first County Engineer started serving in 1920 (Coatesville Record, January 5, 1940). Rambo then went into the real estate business which he continued until his death. Nathan R. Rambo died in 1952 in West Chester (Ibid.).