Historic American Engineering Record Documentation for

Pratt Through Metal Truss Bridge over Clear Creek at Rector Road

Denton County, Texas

Prepared for:
Environmental Affairs Division
Texas Department of Transportation
Austin, Texas

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Structure Identification Number: AA01-65-001

Location: Rector Road at Clear Creek, 1.7 miles west of FM 2164 and 2.5 miles southeast of Sanger and .35 miles north of Nicholson Road in Denton County, Texas

Bridge Type: Pratt Through Metal Truss

Date: 1907-1908

Bridge Company/Contractor: Austin Brothers, Contractors, Dallas, Texas

Significance:
The Rector Road bridge at Clear Creek is representative of the bridges constructed by Denton County during a massive bridge construction campaign in the first decade of the 20th century. In addition, it represents the work of Austin Brothers, Contractors, the only bridge fabricator in Texas at that time. The bridge was listed in the National Register of Historic Places in 2003.

Project Information: This HAER Level III document was prepared for the Texas Department of Transportation by Knight and Associates, Inc. in 2002 and 2003. Research and documentation was performed by Lila Knight, with the assistance of David Wilson.

Physical Description

This Pratt Through truss bridge crosses Clear Creek along Rector Road, located southeast of Sanger in northern Denton County. The total length of the bridge is 112 feet, comprised of three spans with a span 86 feet in length. The bridge is a five panel, pinned truss with an I-beam approach seated on braced metal caisson piers and abutments with metal backing. The endposts and top-chord members were fabricated from a pair of channels, cover plate and battens riveted together. Two pairs of laced angles provide the verticals. An adjustable round rod serves as a counter-brace in one of the central panels. The width of the roadway is 11.9 feet. The bridge is located 2.5 miles southeast of Sanger and .35 miles north of Nicholson Road in northern Denton County.

History

Roads became increasingly crucial for shipping avenues to railroad depots, as well as routes between farms or ranches and local agricultural markets, by the late 19th century. The 1876 Texas Constitution stipulated that counties would be responsible for all road and bridge improvements. But counties were often unable to afford the cost of building permanent, durable bridges until the Texas Legislature passed a number of bills in the 1870s that allowed counties to levy road taxes and issue limited bonds for the construction of roads and bridges. The construction of metal truss bridges, however, remained limited as the cost of shipping heavy metal components prohibited the use of iron and steel bridges by Texas counties.

The last two decades of the 19th century finally witnessed the construction of permanent bridges. The rapid population growth in the state from 1880 to 1900 demanded the construction of additional roads and bridges. It was not until the late 1800s, however, when railroad lines finally provided linkages across most of the state, that counties began erecting bridges capable of sustaining adequate loads. Adequate financing of these bridges was finally addressed during this period. In 1885, a constitutional amendment allowed counties to levy ad valorem property taxes to fund road and bridge projects. By 1887, the Texas Legislature permitted counties to issue bonds (for up to 20 years) specifically for the purpose of erecting bridges. In 1893, the bonding period was increased from 20 to 40 years, stimulating a building boom in bridge construction as it allowed counties to construct multiple bridges with the issuance of one bond. As a result, hundreds of metal truss bridges were erected across the state, particularly in rural areas.

Between 1880 and 1910, Denton County constructed numerous bridges across the county to serve the burgeoning economy prompted by the dramatic increase in population during the period. In 1882, Denton County built the first of its many metal truss bridges with an appropriation of $10,000 from the county's permanent school fund.[1] The source of this initial funding underscores the importance of bridges in the development of schools and educational opportunities during this period. A series of referendum elections between 1880 and 1895 provided the funding for additional bridges throughout the county.[2] By 1890, the county had constructed 17 "iron and wire bridges."[3]

Clear Creek rises north of State Highway 59 in eastern Montague County and runs southeast 47 miles through Cooke and Denton counties to its mouth on Lewisville Lake. As one of the major streams in Denton County, the provision of an adequate bridge was crucial for travel connecting the town of Sanger with the rich agricultural lands and ranching enterprises located to the west. The town of Sanger was established in 1886 by the Santa Fe Railroad and for one of the railroad's most important companies in the area, Sanger Brothers Stores of

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[1] Denton County Historical Commission, "Denton County Iron Bridges," unpublished manuscript.
[2] Denton County Historical Commission, "Denton County Iron Bridges," unpublished manuscript.
[3] Denton Board of Trade, *The Best County in North Texas is Denton*, (Denton: Chronicle Book and Job Printing House, 1890) p. 7.

Dallas. The first train arrived in 1887[4] Thereafter, Sanger served as a major railroad head for the marketing of cattle and agricultural products in north Denton County. The importance of this particular bridge is evidenced by the citizens of the area providing $1,200 of the total cost of the bridge.[5]

On August 26, 1907 the Denton County Commissioners Court accepted the bid of $1,664 by Charles R. Moore, agent for the Austin Brothers Company for the construction of a bridge across Clear Creek. In addition to this metal truss bridge, the commissioners also authorized the construction of a bridge across a slough near the creek for $230.[6] Bids by any other contractors are not listed in the minutes of the court. The bridge was accepted by the court on February 19, 1908 for the original contract price.[7]

Austin Brothers, Contractors, of Dallas were the only major bridge fabricator in Texas. Most bridges during this period were purchased from out-of-state companies, who employed local agents to sell bridges. Only a handful of Texas bridge companies operated in Texas, but these companies merely purchased steel trusses from out-of-state companies and sold them in Texas under their own name. George L. Austin and his brother, Frank, opened a fabrication plant for bridge components in 1910. Previously, George Austin had served as an agent for the George E. King Bridge Company of Des Moines, Iowa. Austin used his contacts from serving as an agent to establish a thriving bridge business in the state, including Denton County who previously had contracted with the King Bridge Company for the construction of bridges. The Austin Brothers firm supplied Warren pony trusses as well as Pratt and Warren polygonal chord pony trusses. By developing a book of standard plans and stocking a large variety of steel products, the Austin Brothers company could provide bridges at a lower cost and in a more timely fashion. By World War I, the company had become the largest bridge builder in Texas. The firm was sold to Charles R. Moore, one of their agents, in 1918 who changed the name to the Austin Bridge Company.[8] The company expanded its operations to oil pipelines, railroad bridges and other steel products after the Texas Highway Department began building concrete and steel bridges in the mid-1930s. More than 200 of the company's bridges are still in existence on Texas roads.[9]

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[4] Eunice S. Gray, "Sanger, Texas," in the New Handbook of Texas (Austin: Texas State Historical Association, 1995) vol. _____

[5] Denton County Commissioners Court Minutes, (February 19, 1908) vol. G, p. 53.

[6] Denton County Commissioners Court Minutes, (August 26, 1907) vol. F, p. 620.

[7] Denton County Commissioners Court Minutes, (February 19, 1908) vol. G, p. 53.

[8] Shannon Miller, *Austin Bridge Company and Associated Companies: The First Fifty Years, 1918-1968*, (Dallas: Taylor Publishing Company, 1974) pp. 1-14

[9] National Register Nomination. "Rector Road Bridge at Clear Creek." (2003) section 8, p. 5. Nomination on file at the Texas Historical Commission and the National Park Service.

Background History of Metal Truss Bridge Construction

The metal truss bridge developed from the timber truss bridge first used during the late 18th century. First utilized by the railroad companies, the metal truss bridge became popular even in more isolated parts of the country along rural roads. Providing a lightweight, durable, and easily erected bridge, these bridges could be broken down and moved to other locations allowing greater flexibility in their use.

This type of bridge is composed of iron and steel members in a geometric arrangement forming a rigid structural framework. Each bridge consists of two trusses, one on either side of the roadway, attached to one another through transverse beams below the deck. The truss acts like a perforated beam, with the top chord handling compressive forces and the bottom chord carrying tensile forces. The upper and lower chords are connected by a series of diagonal members, supplemented by verticals, with inclined posts placed on either end of the two trusses. The diagonal and vertical members connect the two chords and are placed either in compression or tension. Individual truss members of thin, flexible rods or bars can only withstand tension, whereas stiff, heavy posts carry both tensile and compressive forces. The individual truss members are made up of various iron or steel shapes, such as angles, channels, I-beams and rods. Depending on the width of the span, multiple segments, or panels, were utilized. Pins were first used to connect the structural components of bridges in the 1860s. This assemblage inserted large metal pins through reinforced holes in the ends of adjoining truss members. This type of connection allowed trusses to be manufactured and shipped in small pieces. But this type was prone to wear and tear around the connections and produced vibrations. Field riveting replaced pinning by the second decade of the 20th century after development of portable pneumatic riveting systems.[10]

Wrought iron was first employed in bridge trusses in the 1840s, replacing the more brittle cast iron. Its use continued and became the most common material for bridges by 1870. With the increase in steel production after the Civil War, steel became available at a lower cost, becoming increasingly popular as steel mills began producing structural shapes in the strong, durable material. Both wrought iron and steel members were used in bridges during the last decade of the 19th century. By the beginning of the 20th century, however, steel replaced wrought iron as the preferred material for truss bridges.[11]

Patented in 1844 by Thomas and Caleb Pratt, this type of metal truss bridge first became popular with the railroad companies. This bridge type consisted of parallel upper and lower chords joined by vertical and diagonal posts. Unlike the Howe Truss, the Pratt Truss used vertical members in compression and diagonal members in tensions.[12] The Pratt truss became the most popular type of bridge system by the late 1880s. Available in a variety of shapes and

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[10] National Register of Historic Places multiple property nomination, "Historic Bridges of Texas, 1866-1945," Section E, p. 14 (on file at the Texas Historical Commission, the Texas Department of Transportation, and the National Park Service).

[11] Edwards, *A Record of Early American Bridges*, (_____) 103.

[12] "The Developments of the Nineteenth Century in Bridge Design and Construction," *Engineering News* vol. 44 (December 13, 1900) pp. 409-410.

sizes, it was east to erect and provided for a strong, durable bridge. It was used primarily for short to intermediate span lengths (30 to 50 feet). The Pratt Truss bridge became the most popular type of bridge system in Texas between 1895 and 1910.

After World War II, metal trusses became obsolete except for very long spans, such as the Pecos River Bridge (1957) and the Corpus Christi High Bridge (1959). Continuous girder and I-beams of concrete became the most widely accepted bridge type after the Federal Aid Highway Act of 1944 set new standards for bridge construction.

Current Status

In 2002, Denton County worked with the Texas Department of Transportation to preserve its historic bridges through relocation to municipalities across the county. The bridge is scheduled to be removed from its location as it is functionally obsolete. The bridge will be reused in another location in Denton County.

Bibliography

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