

BUNKER HILL BRIDGE
National Covered Bridges Recording Project
Spanning Lyle Creek, bypassed section of Island Ford Road
Claremont vicinity
Catawba County
North Carolina

HAER No. NC-46

PHOTOGRAPHS

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HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C St. NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

BUNKER HILL BRIDGE

HAER No. NC-46

LOCATION: Spanning Lyle Creek at bypassed section of Island Ford Road, Claremont vicinity, Catawaba County, North Carolina
UTM: 17.489571.3953073, Catawba, North Carolina Quadrangle

STRUCTURAL TYPE: Wood covered bridge, Haupt truss

DATE OF CONSTRUCTION: 1894-1895

DESIGNER/
BUILDER: Andrew L. Ramsour, Hickory, North Carolina

PRESENT OWNER: Catawba County Historical Association, Newton, North Carolina

PREVIOUS USE: Vehicular bridge

PRESENT USE: Pedestrian bridge and historic landmark

SIGNIFICANCE: The Bunker Hill Bridge is the only surviving historic covered bridge in North Carolina and the only surviving Haupt truss covered bridge in the United States. Though it never reached the mainstream of bridge building, the Haupt truss is of engineering interest as an innovative example of mid-nineteenth century bridge engineering, as well as for its associations with Gen. Herman Haupt, a prominent nineteenth century civil engineer who did pioneering work in the structural analysis of bridges.

HISTORIAN: Researched and written by Lola Bennett, March 2003

PROJECT INFORMATION: The National Covered Bridge Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Historic American Buildings Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

Chronology

- 1770s Island Ford Road laid out along the line of a trail used by Native Americans
- 1894 Catawba County Commissioners order construction of Bunker Hill Bridge
- 1895 Bunker Hill Bridge built by Andy L. Ramsour and local laborers
- 1900 Bunker Hill Bridge reportedly covered with a roof and siding
- 1916 Bunker Hill Bridge survives flood
- 1921 Original wood shingle roof replaced with metal roof
- 1920s Bunker Hill Bridge bypassed
- 1930s Bunker Hill Bridge closed to local traffic
- 1940 Bunker Hill Bridge survives flood
- 1952 Catawba County Historical Association leads movement to protect Bunker Hill Bridge
- 1954 State creates Connor Park and establishes walking trail to Bunker Hill Bridge
- 1971 Bunker Hill Bridge listed on the National Register of Historic Places
- 1973 Bunker Hill Bridge survives flood
- 1978 North Carolina Department of Transportation rehabilitates Bunker Hill Bridge
- 1980 North Carolina Department of Transportation closes Connor Park due to vandalism
- 1982 Claremont Recreation Commission reopens Connor Park
- 1985 Bolick family donates Bunker Hill Bridge to Catawba County Historical Association
- 1989 Hurricane Hugo damages Bunker Hill Bridge
- 1992 Freak windstorm damages Bunker Hill Bridge
- 1994 Bunker Hill Bridge rehabilitated by DCF Engineering and Arnold M. Graton Associates
- 2001 Bunker Hill Bridge designated a National Historic Civil Engineering Landmark
- 2003 Bunker Hill Bridge recorded by the Historic American Engineering Record

Description

The Bunker Hill Bridge is a single-span wood Haupt truss covered bridge on stone abutments with concrete fenders and caps. The bridge is 80'-4" long from endpost to endpost and has a clear span of 65'-0". The trusses are 13'-0" high from the top of the upper chord to the bottom of the lower chord and 12' wide overall, with a 9'-6" wide roadway.

The truss is framed in the manner patented by Herman Haupt in 1839, but it lacks the auxiliary kingpost truss shown and described in the patent. The upper chords are two lines of 2x12" planks, with a third plank in the end panels. The lower chords are paired 3x12" timbers. The chords sandwich a truss web composed of 6x11" vertical endposts, single 3x12" vertical posts spaced at 5'-8", and paired 2x12" diagonal braces spanning two panels and sloping up toward the center of the bridge. Diagonals in the end panels are 6x11" timbers laid flat, with a cut out for the vertical post to pass through and notched ends to receive the chords. The truss is held together with 2" diameter treenails, three at each lattice intersection and two at each chord intersection. Some members have spliced repairs. Hubrails, composed of 2x12" planks, have been installed along the inner faces of the trusses.

The lower chords rest on 7"x9"x8' bolster beams cantilevered from the abutments. The deck system is composed of 3x10" deck beams spaced approximately 34" on center and notched and seated on the lower chord. The floor beams support a transverse deck composed of two layers of 2x8" and 2x10" rough sawn planks. There are no stringers. Lower lateral bracing consists of five pairs of 2x6" planks crossing between the lower chords. There are running boards, composed of three lines of 2x6" boards on top of the deck.

The upper lateral system is composed of 2x8" tie beams resting on the upper chord and spaced approximately 3' apart. Lateral bracing is 1x10" planks that cross above the tie beams and are nailed to the outer ends of tie beams. There are 2x6" wooden sway braces notched and nailed between each vertical and tie beam. Wooden 2x4" rafters are supported on ends of beams and frame diagonally upward to form a gable roof. Metal fastened to 1x4" purlins on top of the rafters covers the roof.

Board and batten siding covers the exterior of the bridge to just below the eaves. The sheathing is fastened to a 4x5" nailer located on the exterior face of each truss mid-way between the upper and lower chords. The portals have square openings and angle forward over the approaches about 5' on each end. There is horizontal sheathing in the tympanum.

North Carolina Covered Bridges

In 1818, Connecticut architect Ithiel Town built North Carolina's first covered bridge over the Yadkin River near Salisbury.¹ The following spring Town built another covered bridge across the Clarendon River (now Cape Fear River) at Fayetteville. According to covered bridge

¹ Richard Sanders Allen, *Covered Bridges of the South* (New York: Bonanza Books, 1970), p.4.

historian Richard Sanders Allen, one of these bridges may have been the prototype for the Town lattice truss bridge, patented in 1820.² Over the next few years, Ithiel Town traveled to North Carolina periodically to oversee construction of the State Capitol at Raleigh, and his presence may have influenced the building of covered bridges in the area.

There were once reportedly hundreds of covered bridges in North Carolina. An estimated 150 still existed at the turn of the century, but nearly all were lost to floods, neglect, arson or replacement.³ The Bunker Hill Bridge is the only surviving historic covered bridge in North Carolina and the only surviving Haupt truss covered bridge in the United States.⁴ The bridge no longer carries traffic but is maintained by the Catawba County Historical Association as an historic landmark and tourist attraction.

History of Bridge and Site

Island Ford Road, which follows the line of a former Native American trail, was laid out sometime between 1767 and 1780 as part of the main overland route between South Carolina and Kentucky.⁵ During the War for Independence, General Morgan used this road to transport hundreds of British prisoners to the Catawba River, where they were handed over to authorities. The road was later a major thoroughfare for settlers heading north to Kentucky and Ohio.

No written documentation has been found concerning the first bridge at this location, but there was a bridge at this site by 1886, when the crossing appears on R.A. Yoder's "Map of Catawba County." According to Catawba County histories, in the late nineteenth century, local landowners were legally responsible for building and maintaining bridges on their property.⁶

In August 1894, the Catawba County Commissioners ordered J.S. Bridges, agent for owners of the Bunker Hill Farm, "to repair or rebuild the bridge across Lyle's Creek on said land."⁷ J.L. Bridges responded with a petition requesting "that the county assume one-half the expenses of building a bridge across Lyles Creek on the Bunker-hill place, and that ever afterwards, the owners of the land be exempted from further expense in keeping up said bridge."⁸ The Catawba County Commissioners denied this petition, and J.S. Bridges subsequently appealed to the Catawba County Superior Court. The outcome of this litigation has not been found, but according to local tradition, in the spring of 1895, area residents built the bridge abutments with

² Allen, *Covered Bridges of the South*, p.4.

³ Daniel C. Hoover, "Transplanted Yankee Fights to Save Bridges," *News and Observer*, July 13, 1972.

⁴ There are several modern, non-authentic covered bridges in North Carolina listed in the *World Guide to Covered Bridges*, but the Bunker Hill Bridge is the only historic covered bridge that survives.

⁵ Dr. J.E. Hodges, as quoted in "Covered Bridge One of Few Remaining," *Observer-News Enterprise*, June 3, 1983.

⁶ While the origins and details of this law are not known, it is hard to imagine the potential chaos such a precept would create in modern society.

⁷ This area has been known as Bunker Hill, since several Massachusetts families settled here in the early 1800s and named the settlement in memory of the Battle of Bunker Hill (1775), in which 400 American patriots died.

"Commissioners Meeting, Aug. 6, 1894," *Newton Enterprise* (Newton, North Carolina), August 10, 1894, p.3.

⁸ "Commissioners Meeting," *Newton Enterprise*, March 9, 1894, p.3.

stone from a nearby quarry. They hired Andy L. Ramsour of Jacob's Creek to erect the bridge superstructure. Several local men reportedly assisted with the bridge's construction.⁹

The only written record found to confirm the construction date for the Bunker Hill Bridge is an item from the May 23, 1895 edition of the local paper: "Mr. A.L. Ramsour completed the bridge over Lyle's Creek last week and says it is the best bridge in Catawba County. As Mr. Ramsour is not given to idle affirmations, we could hesitate sometime before contradicting his statement."¹⁰

Patented in 1839, the Howe truss almost immediately eclipsed the Haupt truss. Ramsour's reasons for choosing the Haupt truss design are not known. According to covered bridge historian Richard Sanders Allen, Ramsour may have taken his design directly from Haupt's 1851 *General Theory of Bridge Construction*.¹¹ The Bunker Hill Bridge was reportedly originally built as an open span and covered sometime between 1900 and 1905. The bridge carried local traffic until the 1930s. It continued to carry farm vehicles for another decade and was finally closed to all traffic in the 1940s.

In 1952 Raymond L. Hefner and Dr. J.E. Hodges, on behalf of the Catawba County Historical Association, began a movement to protect Bunker Hill Bridge. Two years later, under a lease from local landowners, the State of North Carolina created Connor Park and established a walking trail to the bridge. In 1985 Raenelle Bolick Abernathy and her brother Roland K. Bolick donated the Bunker Hill Bridge to the Catawba County Historical Association. Together with the Newton Chamber of Commerce and the Claremont Lions Club, the Catawba County Historical Association has kept the Bunker Hill Bridge maintained and repaired. The North Carolina Department of Transportation rehabilitated the bridge in 1978, and Arnold M. Graton Associates of Ashland, New Hampshire, more recently rehabilitated it in 1987 and 1994.

The Bunker Hill Bridge was listed on the National Register of Historic Places in 1971, and the American Society of Civil Engineers designated it as a National Historic Civil Engineering Landmark in 2001.

Andrew Loretz Ramsour

Andrew Loretz Ramsour (1817-1906) was a well-known carpenter and businessman from Catawba County. In 1878 he built a wooden toll bridge, known as Horseford Bridge, across the Catawba River at Hickory. That same year, Ramsour established a wagon manufacturing company with George Bonniwell of Philadelphia. The company operated under the name of Ramsour & Bonniwell, and later became the Piedmont Wagon Company. By 1890, the Piedmont Wagon Company produced 500 wagons a month and conducted trade in thirteen

⁹ Evelyn Leonard Deal Rhodes, "The Ramsour Family," in *The Heritage of Catawba County*, Volume I, ed. Lucille M. Fulbright (Newton, North Carolina: Catawba County Genealogical Society, 1986), p.400.

¹⁰ *Press and Carolinian* (Hickory, North Carolina), May 23, 1895, p.5.

¹¹ Allen, *Covered Bridges of the South*, p.8.

states.¹² County directories indicate that Ramsour was proprietor of a grist mill (1869), a forge (1872), and a saw mill (1878-1884) at Jacob's Fork. He is also well remembered for the buildings and bridges he erected in Catawba County. Summarizing an interview with Ramsour in 1905, a local newspaper report stated, "During his long life [Ramsour] has accomplished a great deal as a builder of houses, factories, bridges, etc. He told us he guessed he 'put more licks on the court house than any other man.'"¹³ How Ramsour came to use an obsolete truss type a half century after it was patented has not been determined, but covered bridge historians surmise that he had seen or read General Haupt's book, *General Theory of Bridge Construction*, which illustrates the Haupt truss and was widely available in the United States at that time.

Herman Haupt and the Haupt Truss

Herman Haupt (1817-1905) was a major figure in the development of American railroads and bridge building. At the age of 14, he entered West Point and graduated with an engineering degree in 1835. He began his career surveying railroad lines in Pennsylvania and within a short time he was a much-sought engineering consultant.

In 1838, Haupt was asked to oversee construction of the York & Wrightsville Railroad, along which a number of lattice bridges were intended to be built.¹⁴ Concerned that the bridges might fail under heavy moving loads, he sought advice from a number of the country's prominent engineers and was surprised to discover that Benjamin Latrobe was the only engineer who had ever attempted to calculate the strength of a simple truss, and there were no known mathematical formulas for more complex types of trusses.¹⁵ Unwilling to give up, Haupt decided to make the calculations on his own by modeling bridges and testing them. During these experiments he came up with the design for an "improved lattice truss," for which he later received a patent.¹⁶ In 1841, Haupt anonymously published his findings in a pamphlet, "Hints on Bridge Construction," which, according to Flowers, "attracted much attention and led to some controversy."¹⁷

Until the mid-nineteenth century, bridges were built largely by empirical methods and experimentation. Since structural theory was not well understood, bridges tended to be overbuilt

¹² *Press and Carolinian*, January 1890, p.1.

¹³ *Catawba County News* (Charlotte, North Carolina), July 18, 1905.

¹⁴ In 1820, New Haven architect Ithiel Town (1784-1844) received a patent for a truss with parallel chords connected by a lattice web of overlapping planks pinned together at opposing angles. By eliminating complex joinery and using common sawn planks instead of hewn timbers, Town anticipated this method of bridge construction to be "the most simple, permanent, and economical, both in erecting and repairing."

¹⁵ Frank Abiel Flower, "General Herman Haupt (Personal Sketch)," in Herman Haupt, *Reminiscences of General Herman Haupt* (Milwaukee: Wright & Joys Co., 1901), p.xiv.

¹⁶ Herman Haupt, U.S. Letters Patent No. 1,445, December 27, 1839.

¹⁷ Flower, "General Herman Haupt (Personal Sketch)," p.xv. Historian Carl Condit states that Squire Whipple's (1804-1888) *A Work on Bridge Building* (1847), was the first American treatise on load distribution in truss members; however, Herman Haupt's pamphlet, *Hints on Bridge Construction*, was published anonymously several years earlier. In any case, Condit and Hayden both agree that Haupt and Whipple, along with German engineer Karl Culmann and English engineer Robert Bow, appear to have simultaneously, but independently, reached similar conclusions regarding truss analysis.

to reduce the likelihood of failure. By studying bridge models in a scientific manner, Haupt was able to derive mathematical formulas for determining the optimal size and placement of truss members so as to make structures more efficient and economical. Haupt's patented truss consisted of a horizontal chord truss with vertical posts and multiple-intersection diagonal braces, combined with a full-length kingpost truss. Few Haupt patent truss bridges were ever built, and, according to historian J.G. James, within a short time, Haupt had converted to the Howe truss, "the crowning glory of the wooden bridge era."¹⁸

In 1851, Haupt published his seminal work, *General Theory of Bridge Construction*, which became a standard textbook in engineering schools across the country and established him as an authority in the field of civil engineering. From 1856 to 1861, Haupt was in charge of construction of the Hoosac Tunnel, a project that was the catalyst for many advances in rock-tunneling technology. Extreme financial difficulties forced Haupt to suspend work on the project in 1861.¹⁹ Shortly thereafter, Secretary of War Edwin Stanton called him to Washington to become Chief of United States Military Railroads. Haupt's skill in securing railroad lines and building bridges was critical to the early successes of Union forces and earned him a prominent place in American history books. Nevertheless, on-going persecution over the abandoned Hoosac Tunnel project caused Haupt to resign his post in September 1863 and return to private practice.²⁰

In the remaining decades of his career, Haupt served in a number of important positions, including Chief Engineer of the Tidewater Pipeline, General Manager of the Northern Pacific Railroad and President of the American Air Power Company. Herman Haupt died in New Jersey in 1905 at the age of 89.

¹⁸ Patented in 1840 by Massachusetts millwright William Howe (1803-1852), the Howe truss was the first bridge type to use metal for primary structural members. It improved on Col. Stephen H. Long's 1830 patent truss by incorporating iron rods instead of wooden posts for the tension members, made the connections simpler, easier to build and more efficient under loads. The Howe truss became the dominant bridge truss form during the transition from wood to iron. It was used extensively for railroad bridges in the United States and Europe throughout the mid-nineteenth century. J.G. James, "The Evolution of Wooden Bridge Trusses to 1850," *Institute of Wood Science Journal* 9 (December 1982).

¹⁹ Controversial from the beginning, the Hoosac Tunnel project became a heated political battleground, with the contractor left to fend for himself. Unable to obtain the necessary capital from would-be backers, Haupt financed much of the construction by mortgaging personal property and obtaining loans. He was professionally humiliated and deeply in debt when work on the tunnel was suspended in 1861, and despite numerous legal actions and personal meetings with the governor and state treasurer, Haupt never received the money the State of Massachusetts owed him. Completion of the tunnel would take another fourteen years and cost the State of Massachusetts an additional \$20 million.

²⁰ Herman Haupt, *Reminiscences of General Herman Haupt* (Milwaukee: Wright & Joys Co., 1901), p.xxviii.

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