

MCPHERSON'S FORD BRIDGE
(Bridge No. 6064)
VA Route 633 over the Cowpasture River
Clifton Forge vicinity
Alleghany County
Virginia

HAER No. VA-104

HAER
VA
3-CLFO.V
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

HISTORIC AMERICAN ENGINEERING RECORD
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LOCATION: Route 633 over the Cowpasture River, 2.1 miles northeast of the junction of Routes 633 and Route 220 Clifton Forge Vicinity, Alleghany County, Virginia. USGS Clifton Forge, VA Quadrangle, Universal Transverse Mercator Coordinates: 17.609220.4183250

DATE OF CONSTRUCTION: 1896-1897

ENGINEER: Nelson & Buchanan, Engineers and Contractors, Chambersburg, Pennsylvania

PRESENT OWNER: Virginia Department of Transportation

SIGNIFICANCE: The McPherson's Ford Bridge is a representative example of a pin-connected steel Pratt through truss, typical of late nineteenth century factory manufactured bridges.

PROJECT INFORMATION: The McPherson's Ford Bridge was recorded during the spring of 1994 by the Cultural Resource Group of Louis Berger & Associates, Inc., Richmond, Virginia for the Virginia Department of Transportation (VDOT). The recordation was undertaken pursuant to provisions of a Programmatic Memorandum of Agreement (Draft) among the Federal Highway Administration, VDOT, the Virginia SHPO and the Advisory Council on Historic Preservation concerning management of historic metal truss bridges in Virginia. Project personnel included Richard M. Casella, Architectural Historian, Alison Helms, Historian, and Bruce Harms, Photographer.

DESCRIPTION

McPherson's Ford Bridge (VDOT Bridge #6064) is a three-span, pin-connected steel through truss bridge which carries a single lane of Virginia State Route 633 in a northeast-southwest direction over the Cowpasture River, 2.1 miles northeast of the junction of Route 633 and Route 220, in the southeastern part of Alleghany County near the Botetourt County line. The bridge is approximately two-miles upstream from the point where the Cowpasture and the Jackson rivers meet to form the James River. The southern approach to the bridge departs the James River valley at Lick Run in Botetourt County, a former shipping point on the Chesapeake and Ohio Railroad, and then runs northeast, crossing the county line and the Cowpasture River before joining the Old National Highway (Figure 1).

At the point of the bridge the riverbed is approximately 130' wide, extending just beyond the two piers. The center truss is approximately 26' above the riverbed. The east and west trusses span floodplains at an average height of 21' and 17' respectively. The depth of the river averages approximately 2' in the summer. The bridge is situated in a wide river valley surrounded by forested mountains. The immediate area around the bridge is open rolling farmland and pasture with widely spaced farm complexes and residences.

Overall, the bridge is 317'-8" long, with three identical trusses, each 104'-1-1/2" long. For clarity the truss description will be given in the singular. The truss is a Pratt type, with parallel chords, posts in compression and diagonals in tension. All members of the bridge are steel, joined with pinned, riveted or threaded connections. The truss is 18' high, 18' wide and 104'-1-1/2" long with six panels, each 17'-4-1/2" wide.

Top chords and inclined end posts are riveted box sections, 12" x 7-1/2" overall, built with 12"x1/4" top plate, 7"x2-1/4" side channels with flanges turned out, and 12"x4"x1/4" bottom stay plates spaced approximately 2' on center. The truss rides on friction-plate bearings and fixed bed-plate bearings; both types are 14"x21" overall. Bottom chords consist of paired die-forged eye-bars of two sizes. The bottom chords of panels one and two (panels are counted in from each end) are 3/4"x2". The third panel bottom chords are 1-1/4"x2".

The riveted box-section bar-lattice posts are 11-1/2"x6" overall, made up of two 6"x2" channels with flanges turned out, spaced 7-1/2" apart, and connected by a single bar-lattice on the top and bottom. Main diagonal panel braces are located in the second panel and consist of paired die-forged eye-bars, 2"x3/4". Third panel diagonals consist of a pair of 1" square loop-welded bars, and an opposing counter, also a 1" square loop-welded bar with 1-1/4" upset threads and a turnbuckle.

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Hip-verticals consist of two 7/8" square loop-welded bars. The bottom eyes connect with the floor-beam hanger plate with 2" pins. Bottom chord pins are 3"; top chord pins are 2-7/16" except at the endposts which are 2-7/8".

Portal bracing consists of a strut, braces and a lower or secondary strut. These members are all riveted T-sections, 6-1/4"x3" built of 3" angles. The area between the struts and braces are infilled with quadruple-intersecting bar-lattice. Upper lateral struts are lattice-bar I-sections, approximately 8"x3" overall, consisting of T-section flanges and lattice-bar webbing. Upper lateral bracing rods are threaded both ends, and connect with skewback brackets riveted to the strut end-plates. Sway braces are located at each lateral strut and consist of riveted T-sections, of 3" angles.

The floor beams or floor girders, are riveted I-section plate girders, 22"x6-3/8" overall, constructed of 3/8" web-plate and 3"x2-1/2" angle flanges. The girders are unusual due to the lower flange which is constructed with the riveted leg turned outward. The girders are suspended from the bottom chord pins at each post by 1/2" thick by 7" wide beam hanger plates, bent at a right angle to provide a 5"x7" beam seat. A total of eight floor stringers of 10"x4" I-beams are spaced variably between 21" and 26" and rest on the girder. Bottom lateral bracing rods are threaded both ends and connect with skewback brackets riveted to the girders just above the lower flange.

The bridge decking consists of 4"x10" pressure-treated wood planks with a 1/2" asphalt overlay, attached to the stringers with carriage bolts and deck clips. The roadway is 14'-11" wide and edged with 4"x6" wood curbing raised 4" off the decking with wood blocks spaced approximately 4' on center. The bridge railings consist of two rows of 1-1/2" pipe attached to the posts with U-bolts, 10" and 30" off the deck.

Both ends of the bridge rest on U-type abutments, 24' wide, of coursed random ashlar limestone. The stone is quarry-faced and the top course is of uniform blocks, overhung 3" to form a coping. The east abutment wings have been repaired with cast-in-place concrete. The east abutment is approximately 14' high and the west abutment is approximately 10' high.

The two stone piers supporting the center span are constructed of coursed random ashlar limestone with copings as described above and rounded upstream faces. The piers are approximately 25' above the riverbed and battered on all faces.

Two cast iron plaques are mounted on the end post and identify the builder and local officials associated with the bridge. The plaques read as follows:

Nelson and
Buchanan
Engineers and
Contractors
Chambersburg
1896 PA

and,

E M Nettleton
C M McElwel
H P Carson
Supervisors
J J Hubbs
Clerk
Wm P Marshall
Engineer

HISTORICAL INFORMATION

Background

Frontiersmen began to establish plantations in the upper James, Jackson, and Cowpasture River valleys in the 1750s, exploiting the flat bottomland of the river valleys for agricultural purposes, and the woodland of the adjacent mountains for building materials, fuel, and game. Valley products, including pig iron, forged iron, lumber, and farm produce, were initially shipped down river on flatboats. By the second decade of the nineteenth century, efforts to improve transportation in the area were underway, including the construction of turnpikes and canals, and an attempt, ordered by Act of Assembly of Virginia, to transform the Cowpasture River into a navigable waterway (Corron 1971:1; Morton 1923:58-60, 69-70).

In 1825, the land surrounding the site of the McPherson's Ford Bridge was part of a plantation owned by Abraham Ritzer (Boye 1825). At that time, the main road leading east up the Cowpasture valley from the head of the James River crossed the river twice: once at a ford near the Alleghany-Botetourt line, and again at a point about three-quarters of a mile upstream from the site of the present bridge (Boye 1825; USGS 1986). The precursor to State Route 633, which replaced the old road, was probably built to access a "mill seat" mentioned in the 1878 deed of sale to William H. McPherson (Alleghany County Deed Book 7:648).

Railroad transportation arrived in Alleghany County in 1867, when the Chesapeake & Ohio (C&O) Railroad, formerly the Virginia Central, was built as far as Covington (Morton 1923:61). In 1881, the Richmond and Alleghany Company acquired the James River and Kanawha Canal, and utilizing the towpath for a roadbed for much of the line, built a railway from Richmond to Clifton Forge. The route rapidly became an important freight-carrying road, and in 1890, the line was sold and reorganized as the James River Division of the Chesapeake & Ohio (C&O) (Morton 1923:62).

The railroad brought agricultural prosperity and an industrial-based boom to the entire Shenandoah Valley in the 1880s and 1890s. The improved transportation prompted a wave of speculation that resulted in the establishment of new towns, and spurred the growth of existing industrial establishments such as the iron furnaces at Clifton Forge and Longdale. After the arrival of the railroad, Clifton Forge, situated at the western terminus of the James River Division, became the transportation center of the county. The C&O located its shops at Clifton Forge in 1890, an action which, accompanied by a boom in the iron industry, prompted enormous growth during the period 1890-96 (Arritt 1982:49; Hensley 1979:14; Morton 1923:72).

The same boom was responsible for the success of the industrial town of Iron Gate, located two miles south of Clifton Forge below the gap between Wilson and Rich Patch Mountains. Iron Gate was surveyed in the early 1880s as a speculative venture associated with railroad development. The Alleghany Iron and Ore Company opened blast furnaces in the north end of town in the late 1880s, and, soon after the furnaces were established, the U.S. Leather Company opened a tannery (Adkins et al. 1989:16; Arritt 1982:54). By 1893, the population of the town reached 1,500 (*Fincastle Herald* 1893).

A petition for the construction of a highway bridge over the Jackson River at Iron Gate was made by the citizens of Iron Gate in 1896, when Clifton Forge and Iron Gate were in the midst of their late nineteenth century economic booms. The ensuing series of discussions, field visits and decisions made by the County Board of Supervisors resulted in the construction of the McPherson's Ford Bridge in 1897.

History of McPherson's Ford Bridge

McPherson's Ford Bridge, also known as the "Cowpasture River Truss" was built during the winter and spring of 1897, in a section of the Cowpasture River valley east of Iron Gate where agriculture was thriving. At the time, the farm on the north side of the river was owned by the McKinney family, and the farm on the south side was owned by William H. McPherson, a prominent county citizen who had served on the Board of Supervisors from 1883-1891 (Alleghany County Board of Supervisors Papers-Rinehart & Valz contract, November 14, 1896; Deibler 1973; Morton 1923:152).

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The construction of the bridge over the Cowpasture River at McPherson's Ford was the result of lengthy, and ultimately unresolvable, discussions to build a highway bridge across the Jackson River at Iron Gate. County documents and records related to the building of the bridge were filed initially under the "Iron Gate Highway Bridge Matter", and later under the "McPherson's Ford Bridge Matter" (Alleghany County Board of Supervisors Order Book 2; Alleghany County Supervisors Papers 1894-97, Box 419).

The citizens of Iron Gate petitioned the Alleghany County Board of Supervisors for construction of a bridge on February 29, 1896. After considering the matter, the Board appointed five commissioners to meet on March 5 to view several proposed locations for the bridge. The commission was ordered to report back with recommendations as to location, type of bridge (including materials and dimensions), probable costs of construction, approaches and road changes, and estimated costs of damages payable for lands taken during the building of the bridge (Alleghany County Board of Supervisors Order Book 2:140).

The bridge commission, made up of appointees Thomas D. Kyle, A.A. McAllister, J.E. Johnson Jr., W.H. McPherson, and A.M. Stull, made their initial site visit as directed and filed a lengthy viewing report with the Board of Supervisors May 9, 1896. The report, dated May 5, stated that the commission was unanimously of the opinion that the bridge should be built. The three reasons given in support of the bridge construction reflected the desires of county residents to improve communication, facilitate commodities exchange, and promote industrial and economic growth (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896). First, it was believed that the bridge would "open permanently and for the whole year a means of communication between the north eastern portion of the county and the central and western portions of which is now entirely impassible for traffic of any kind throughout a large portion of the year, and avoidable only by a detour of several miles" (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896). Second, it was hoped that the bridge would facilitate communication between Alleghany County and its neighboring counties to the south, including Rockbridge, Botetourt, and Bath, and would afford residents of southern areas improved access to the city of Clifton Forge which had emerged as the primary exchange point for all railroad traffic operating through the county outside of Covington. Lastly, the commissioners believed that the bridge would provide a greater number of Alleghany County citizens with opportunities for economic growth associated with industrial operations:

In considering the importance of these routes of communication it must be remembered that it is not the ordinary intercourse of agricultural communities which is to be benefitted, but that between the manufacturing, mining, and railroad section of this and adjoining counties and the agricultural sections surrounding them the importance of which communication is so great as to amount almost to necessity and which is beneficial to the whole county (Alleghany

County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed
May 9, 1896).

During the site visit, the members of the commission examined four locations for the proposed bridge, which they referred to as Cases I, II, III, and IV. In the month that followed, they obtained from bridge companies estimates of the relative costs of construction at the different sites, and compared the costs of iron and wood construction. The delivery of materials to the bridge site could be handled economically, because the James River Division of the C&O Railroad passed near the site, and maintained a shipping point at Lick Run, about one mile to the south.

Case I, also called the "lower site", was located about 1,200' below the existing ford opposite the Iron Gate Station, at a point where a bluff of solid slate projected into the river on the northeast bank, just at the end of a long, steep rapid, where the width of the flood plain to be spanned measured between 390' and 400'. The approach on the northeast bank of the river at this point could easily be built using the original grade of the Richmond and Alleghany Railroad, while the construction of an approach on the southwest bank was complicated by the necessity of crossing the Main Line of the James River Division of the C&O Railroad, as well as three sidings serving a rolling mill, tannery, and a double-ended parallel siding. Construction cost estimates for two general designs were requested: (1) three spans of 130' each and (2) one span of 150' and two of 120'. The figures for both cases were nearly identical, and it was concluded that the superstructure of either bridge could be built at this location for approximately \$5,200. Including abutments the cost would rise to approximately \$8,500 (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896).

Case II, the second site considered, was located near the center of the gap, at a place where an older bridge had stood, where remnants of old abutments remained in the river bed. The floodplain in this area was narrow enough to be traversed by a single span structure, and this was therefore thought to be the cheapest site. Major disadvantages of choosing this location included the fact that all traffic passing north and south along the river would have to be diverted about three-quarters of a mile away from the direct line, and the very serious problem that the approach on the southwest bank would probably interfere with the railroad right-of-way, which in that area and for a distance of about one quarter of a mile to the south, left little or no room for a highway. Estimates for two spans of 162' each, or three of 108' each were obtained. The cost of the three span alternative proved to be much greater than the two span (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896).

Case III, the third site examined was situated above the Lithia Spring, approximately 100' upstream from the existing ford. At this location, also referred to as the "upper site", the river bed was approximately 320' wide. Very little construction in the way of approaches was thought to be necessary on the northeast bank of the site. On the southwest bank, however, the approach

would pass over the main line of the James River Division and two sidings serving the iron furnace. In addition, a low trestle would be required to carry the road over a cinder dump of the Alleghany Iron Company. Estimates for the same set of three-span alternatives requested for the first site were obtained for this alternative, and it was determined that the superstructure of a bridge at this location could be built for approximately \$4,000. Including abutments, the estimated total cost came to \$9,130 (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896).

Case IV, the last site to be considered, was located opposite 3rd Street in Iron Gate. A bridge built at this location was desired by the citizens of Iron Gate to connect 3rd Street on the southwest side, about 200' below the furnace, to a point on the northeast bank about 300' downstream from the existing ford. The river bottom at this crossing measured about 500', a length that the commissioners estimated would result in a cost amounting to at least \$2,000 or \$3,000 more than any of the other sites. Given that the approach on the southwest bank at this location was no more convenient than any of the other choices with respect to the problem of crossing the railroad's main line and sidings, the commissioners dropped this site from consideration and did not request cost estimates from bridge companies (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896).

Following analysis, the commission reached the consensus that Case I, the "lower site" and Case III "the upper site" were the preferred locations. A bridge constructed at either of these sites required, however, that northbound highway traffic be diverted from the direct line through Iron Gate and the gap, by about one-half mile. To alleviate this inconvenience, the possibility of relocating the "road through the gap" to the other side of the river was considered. Ultimately, the bridge commission left the decision as to which case to pursue to the Board of Supervisors, and earnestly recommended that the board hire a trained bridge engineer to handle the matter. It was recommended that the engineer survey the potential sites, determine facts which would allow the commission and the board to decide between alternatives, draw general specifications, and superintend the construction work "from the first stone laid to the last rivet driven" (Alleghany County Supervisors Papers-Iron Gate Bridge Commissioner's Report No. 1, filed May 9, 1896).

On May 9, 1896, the Board of Supervisors ordered the bridge commission to proceed with preparing plans and receiving bids for the Iron Gate Highway Bridge, and authorized the commission to hire a bridge engineer to assist them in carrying out the order. One-half of the cost was to be paid for from the County Levy of 1896, and one-half from the levy of 1897 (Alleghany County Board of Supervisors Order Book 2:148).

Six weeks later, on June 20, the bridge commissioners reported to the Board that they had not yet prepared specifications because "unforeseen complications" had arisen in deciding the matter of location. At the same meeting, testimony was heard from the representatives of the Town

of Iron Gate, the Alleghany Iron Company, and others concerned with the matter of location. The Board reconvened on July 15 to pursue the discussion, and to consider what could be done in terms of right-of-way arrangements for approaches to the bridge at any of the proposed locations. After the hearings, the Board ordered that the commission advertise bids for building a bridge at all three sites (Alleghany County Board of Supervisors Order Book 2:149).

On July 27, five months after the initial petition was filed, the Bridge Commission presented the Board with copies of plans and specifications for a highway bridge at Iron Gate, and the results of the bids received for the construction of the structure. At the same meeting, the commission filed a second report stating that the question of obtaining right-of-way for a bridge at any of the Iron Gate sites remained far from settled:

Since making our last report we find that such bitter opposition has developed at Iron Gate on the part of the Alleghany Iron Co., the Iron Gate Land and Imp. Co., and the Town Council of Iron Gate to putting the bridge at any of the points where it should go that we do not think it practicable to get a bridge there without a lawsuit into which we are unwilling to go (Alleghany County Supervisors Papers-Commissioner's Report on Bridge at Iron Gate, July 27, 1896).

In view of the difficulties of building at Iron Gate, the commission's second report suggested that a bridge across the Cowpasture River at McPherson's Ford, near the residence of William H. McPherson (one of the members of the bridge commission) might provide an acceptable alternative. After performing a survey of the area, the commission determined that a bridge could be built at that location at less expense than at Iron Gate, and the question of right-of-way could be easily settled. The commission then presented plans and bids, and numerous statements from citizens were heard and considered. Based on these statements the Board determined that a bridge at McPhersons would not meet the needs of the people, because even if it were built, it would not do away with the necessity of ultimately bridging the Jackson River at Iron Gate. The Board subsequently rejected all the bids received for a bridge at McPherson's, and declined to build a bridge at that location. All the bids received for construction of a bridge at Iron Gate were also rejected, as they were beyond the means of the county (Alleghany County Board of Supervisors Order Book 2:157-58).

Following this action, the Chairman of the Board, Mr. E.M. Nettleton, was ordered to confer with the authorities of the (C&O) Railway Company, to determine what the company would do in the way of building a county road on the east side of the Jackson River from Iron Gate to Clifton Forge in the event that the bridge at Iron Gate should be built. He was also to report on the advisability of abandoning the road on the west side of the river between the same points in case a replacement road should be built on the east side. In addition, Nettleton was directed to confer with the authorities of the Town of Iron Gate and report on the amount the Town would be able to contribute toward the cost of a bridge, to report fully on the question of

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securing the right-of-way and approaches to the bridge (Alleghany County Board of Supervisors Order Book 2:157).

Nearly a month-and-a-half later, at a meeting of the Board of Supervisors held September 12, 1896, the Board reconsidered the matter of the McPherson's Ford Bridge as an alternative to the proposed Iron Gate Bridge. A petition, filed on September 12, and signed by 53 individuals read:

We, the undersigned, citizens and taxpayers of the Eastern end of Alleghany County, respectfully request your Hon. Board to take steps to build a bridge at McPherson's ford, on the Cow Pasture river. This ford is always deep, and at many seasons impassible. A bridge there would be a great convenience, and furnish an outlet to us to the James River division of the C&O Railway at Lick Run, which would be more convenient than to any other point.

Your petitioners would represent that they have had but little share in the improvements in the way of bridges erected in the County within the past ten years; and feel that they are entitled to this relief (Alleghany County Supervisors Papers-Petition to the Board of Supervisors of Alleghany County, filed September 12, 1896).

Further discussion convinced the Board that building a bridge over the Cowpasture River at McPherson's ford was desirable, and the July 27 order declining to build the bridge was rescinded. The Board then officially abandoned the plan to erect a bridge over the Jackson River at Iron Gate, the difficulty in obtaining right-of-way for the approaches having become insurmountable, and the expense of relocating the necessary roads having been determined to be too high (Alleghany County Board of Supervisor's Order Book 2:162).

In pursuit of the newly adopted scheme, E.M. Nettleton (Chairman of the Board) and Supervisor C.M. McElwee were ordered to advertise for bids for the building of the bridge at McPherson's ford, according to the drawings and specifications submitted at the previous meeting. Bids were to be requested for the superstructure and foundation work separately, and for iron or wooden superstructure, at the preference of the bidders. In addition, Chairman Nettleman and Supervisor McElwee were directed to make arrangements for right-of-way and approaches, and were authorized to employ an engineer in carrying out the requirements of the order if it was deemed necessary (Alleghany County Board of Supervisors Order Book 2:162).

On October 17, the Board considered the bids received, and pending the negotiation of a satisfactory site and right-of-way arrangements, accepted the bid of Rinehart & Valz for the masonry, foundations, grading, and timber work necessary for foundation and coffer dams; and that of Nelson & Buchanan for iron superstructure. After the primary task of securing the right-

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of-way was accomplished, supervisors Nettleton and McElwee were empowered to enter into contract with Rinehart & Valz and Nelson & Buchanan, and take bonds to secure the faithful performance of their contracts. Half of the cost of the bridge was directed to be paid out of the County Levy of 1896, and half out of the levy of 1897 (Alleghany County Board of Supervisors Order Book 2:171).

In a contract made with the members of the Board of Supervisors of Alleghany County dated October 28, 1896, Nelson & Buchanan of Chambersburg, Pennsylvania, agreed to furnish all materials, build, paint, complete and have ready for use by February 1, 1897, the superstructure for a highway bridge consisting of three spans, 104' each from center to center, with a 16' roadway clear between trusses. The materials, except for the abutments and piers, were to be furnished by the contractor, and the work was to be done in a thorough and workmanlike manner in accordance with the plans designated "X" annexed to the contract, and with Theodore Cooper's Specifications of 1896, for Class B-1 loading. The bridge was to be completed to the satisfaction of an engineer appointed by the county to supervise the construction. The county agreed to have the abutments and piers ready for the superstructure by January 1, 1897. Nelson & Buchanan were to be paid \$4,190 for the work; \$2,095 out of the County Levy of 1896, and \$2,095 out of the levy of 1897. The contract also stated that Nelson & Buchanan were not to be held responsible for unavoidable delays arising from "accidents in transportation or from the elements, or from labor strikes, or on account of any delays arising from any default on the part of the county" (Alleghany County Supervisors Papers-Nelson & Buchanan contract, October 28, 1896).

The agreement was signed by George Lehrer, agent for the firm, and on the same day, T.M. Nelson and Andrew Buchanan, partners as Nelson & Buchanan, entered into a bond with the county for the sum of \$8,380 to perform the contract. William P. Marshall, the Engineer in charge of the project at the time, and E.M. Nettleton, Chairman of the Board, approved and accepted the proposed plans for the bridge on October 28, 1896. The documents were presented to the Board on November 14, 1896, the day the contract for building the masonry and substructure was signed (Alleghany County Supervisors Papers-Nelson & Buchanan Bond, October 28, 1896; Alleghany County Board of Supervisors Order Book 2:178).

The contract for the substructure, negotiated between the Alleghany County Board of Supervisors and W.A. Rinehart and A.M. Valz, trading as Rinehart & Valz, stated that the contractors were responsible for building masonry cofferdams and performing all the excavation and grading necessary for the approaches to the bridge. The county agreed to furnish the cement, and required that all mortar used in the face walls be mixed of half cement and half sand, and that all mortar used in the backing should be mixed two parts sand and one part cement. It was additionally specified that the sand should be clean and sharp, free from loam, screened if necessary, and equally as good as the sand found at the junction of the Cowpasture and the Jackson Rivers, two miles to the south. The substructure was to be completed and ready

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to receive the superstructure within seventy days of the contract date. W.A. Rinehart and A.M. Valz furnished the county with a bond for \$6,000 to faithfully perform the work on November 14, 1896, the day the contract was signed (Alleghany County Supervisors Papers-Rinehart & Valz contract, November 14, 1896).

While the bridge plate attached to the superstructure of the bridge indicates that William P. Marshall acted as engineer, county records show that at some point after construction commenced the role was turned over to D.A.A. Keyser. Marshall was paid \$110 for services as county engineer up to November 14, 1896 (Alleghany County Board of Supervisors Order Book 2:174). That same day, E.M. Nettleton, Chairman of the Board, posted a letter to Nelson & Buchanan requesting them to commence construction. Nelson & Buchanan replied on November 16th:

Your letter of 14th inst. received and contents noted. We will take up your bridge at once, and push it forward with all possibly [sic] dispatch. You may rest assured that we will give you a bridge first class in every particular. We will send your Engineer a copy of the plans for his inspection and approval as soon as they can be gotten ready (Alleghany County Supervisors Papers-Nelson & Buchanan letter to Nettleton, November 16, 1896).

December 15, Nettleton communicated to Nelson & Buchanan to proceed with the bridge according to the original plans filed with the contract, and by December 26, the company ordered the required iron materials from their shops in Pittsburgh (Alleghany County Supervisors Papers-Nelson & Buchanan letter to Nettleton, December 17, 1896; *Clifton Forge Review* 1897). The order was evidently placed after December 17th, because a letter bearing that date from Nelson & Buchanan reminded Nettleton that according to Cooper's specifications, "no work shall be commenced or materials ordered until the working drawings are approved by the Engineer in writing, if such drawings are retained more than one week for examination, the Contractor will be allowed an equivalent extension of time" (Alleghany County Supervisors Papers-Nelson & Buchanan letter to Nettleton, December 17, 1896).

On the day the order was placed, Nelson and Buchanan were under the impression that W.P. Marshall was serving in the capacity of bridge Engineer, and requested that Marshall's name appear on the bridge plate. December 26, the firm received notice that D.A.A. Keyser was to be the engineer in charge of the project. In a communication to Keyser dated December 26, 1896, Nelson & Buchanan wrote:

Your letter of 22nd. to Mr. E.M. Nettleton has been handed us, and hence we conclude that you are to be the engineer in charge of bridge over Cowpasture river, which we are building. We note your corrections, and will make every effort to comply with them, although we have ordered the bridge to be proceeded

with according to the original drawings because of a letter written us by Mr. Nettleton December 15th. We notice your request for shop plans, and we will send you a copy as soon as we find whether these changes can be made or not. We do not suppose that you will insist on these changes in case the other material has already been delivered? (Alleghany County Supervisors Papers-Nelson & Buchanan letter to Nettleton, December 26, 1896).

The contractors reassured Chairman Nettleton in a letter dated December 30, 1896, that the bridge would be built in strict accordance with specifications, but indicated that there was need to watch all expenses carefully in order to come out even in the enterprise (Alleghany County Supervisors Papers-Nelson & Buchanan letter to Nettleton, December 30, 1896).

On January 1, 1897, Nelson & Buchanan answered a letter from D.A.A. Keyser:

We have word from the shops that all the changes you indicate can be made without loss, except the lower chord bars. The lower chord bars were made of steel, and were ordered immediately after receipt of Mr. Nettleton's letter of December 15th. wherein he stated that they were not going to have an engineer and that we should go ahead with the bridge. The eye bars are now completed and ready to ship. These bars were not made at our shops, but at a steel eye bar plant at Cleveland, and they will not be shipped with the other parts of the bridge. To change these bars will occasion us considerable extra expense, and as we had been told to go ahead with the bridge before your letter was received, we consider it fair to ask you to recommend that the county bear this expense (Alleghany County Supervisors Papers-Nelson & Buchanan to Keyser, January 1, 1897).

D.A.A. Keyser apparently received mail in Lick Run, VA, at the junction of the Cowpasture and Jackson rivers during the period he served as engineer on the project. He responded January 4, on stationery from the Alleghany Hotel, Covington, where he crossed out "Covington", and substituted "Lick Run":

Gentlemen: Referring to yours of the 1st inst. I am glad to know that you will have no trouble in change of bridge, excepting the bottom chords. As regards the xtra expense to you in changing the eye beams -- I do not see that I can consistently recommend the Co's paying any part of the expense whatever. Notwithstanding the fact that Mr. Nettleton may have written you the Co. would not have an Engr. -- That does not alter the contract wherein you agree to put up a bridge of certain strain & loading. -- If upon a careful examination I find you have made an oversight, and the dimensions of material will not bear the strain upon it, -- I fail to see that the Co. through its representatives are

responsible. In making changes I have tried to do you justice in every possible way and where dimensions in some parts were increased, it was really only when the bridge was weak and not up to specifications and in order to compensate you in this, I have lightened the amt of material in other places (Alleghany County Supervisors Papers-Keyser letter to Nelson & Buchanan, January 4, 1897).

The construction of the substructure of the bridge was underway by November 28, 1896 and continued while issues related to the strength of the superstructure were being resolved. The masonry and the grading for the bridge were completed by February 12, 1897, close to the contract scheduled date of January 22, 1897. In a short news piece released by D.A.A. Keyser, the engineer reported that the bridge would soon be ready for public use and claimed that it would be the best bridge in the county (*Clifton Forge Review* 1897).

Finishing touches continued for two more months. On March 13, 1897, the Board compensated F.J. Wyatt \$229.85 for making a change in the road at the bridge (Alleghany County Board of Supervisors Order Book 2:183). D.A.A. Keyser posted his final engineer's report to the Board of Supervisors from Lick Run, on April 24, 1897. The report, witnessed by William H. McPherson, read:

I desire to state that on this day I made a test of Cowpasture River Bridge in Clifton District -- by loading as follows --

Weight of wagon	1,600 lbs
Weight of test load	10,700
Weight of wagon & load	12,300 lbs
Weight of team	4,800
Total weight of team & load	17,100 lbs

The above load being hauled over the bridge left no sign of weakness or defect in any respect whatever (Alleghany County Supervisors Papers-McPherson Ford Bridge Engineer's Report, April 24, 1897).

On May 8, 1897, the county paid William H. McPherson \$5.00 for hauling the test load of stone, and entered the final orders upon the Order Books:

It appearing that the Bridge over the Cowpasture River at the McPherson ford has been completed in accordance with the specifications, therefor, it is ordered that

warrants issue as follows to the Contractors for the sub- and superstructure of said bridge in full of balances due them respectively under their contracts:

To Nelson & Buchanan for superstructure, warrant for one half contract price of \$4190 payable out of County Levy of 1896	\$2,095.00
To Same warrant for residue of said contract price payable out of County Levy of 1897	\$2,095.00
To Rinehart & Valz for balance due on foundations & c.	
Warrant payable out of County Levy of 1896	\$479.89
Warrant payable out of County Levy of 1897	\$479.88
Warrant payable out of County Levy of 1897	\$1,266.00

Rinehart and Valz appeared in person at the meeting to demand further compensation for the contract, but, after carefully considering their statements and evidence, the statements of the Engineer, and reinspecting the contract and the final estimates of the Engineer, the board concluded that they been paid the full balance due them under the contract, and disallowed the claim for further compensation (Alleghany County Board of Supervisors Order Book 2:186).

Alleghany County maintained full responsibility for the maintenance of the bridge until about 1910, when assistance was first sought from the state. On May 21, 1910, the Board borrowed \$80,000 as provided by Act of Assembly of Virginia (Chapter 84 Acts 1910), and with the loan issued Coupon Bonds of the County at a value of \$1,000 each, known as "Court House and Bridge Bonds", bearing the date July 1, 1910, and interest at 5% per year (Alleghany County Board of Supervisors Order Book 3:315). By 1917, the maintenance of all the bridges in the county was handled by the State Highway Commission (Alleghany County Board of Supervisors Order Book 4:276).

Thomas Pratt and the Pratt Truss

Thomas Pratt was born in Boston in 1812, the son of noted Boston architect Caleb Pratt. Thomas was thoroughly educated by his father in the sciences, entered Rensselaer Polytechnic Institute at age 14, became an engineer with the United States Army Engineers at 18, and began a professional engineering career with Boston & Maine Railroad at age 21. At the beginning of his career, which lasted until his death in 1875, Pratt was probably the best educated bridge engineer in America. Pratt worked his entire life in the employ of various New England railroad companies, including the Providence & Worcester, the Hartford & New Haven, and the New York & Boston (American Society of Civil Engineers [ASCE] 1876:332-333; Condit 1960:108).

Pratt is best remembered for a bridge truss that he designed in 1842, that consisted of two parallel chords connected by vertical wood posts in compression and double wrought iron diagonals in tension. The design, while similar in appearance to the truss recently patented by William Howe, functioned structurally opposite to the Howe truss, Howe having put the verticals in tension and the diagonals in compression. Modern engineers consider the Pratt design to be the first scientifically designed truss (Condit 1960:109). Pratt had recognized and applied a basic principle of structural engineering to truss design: reducing the length of the member in compression reduces the bending moment, allowing members of smaller cross-section to be used without sacrificing overall strength. The basic design premise of a truss is to provide equal strength with less weight and material than a solid beam and Pratt's innovation applied that principle to the design of the components of the truss itself.

In 1844, Pratt and his father were granted a patent for two truss designs, one with parallel chords, and one with a polygonal top cord. Either design could be built of a combination of wood and iron, or just iron alone. The polygonal version again reflected Pratt's understanding of the application of mathematical principles in calculating the forces involved and the precise strength of material required to counter those forces. Pratt's patent was renewed in 1858. The use of the Pratt truss for the deck of John Roebling's Niagara River Suspension Bridge in 1855

drew worldwide attention to the design and undoubtedly contributed to its increased usage. One of Pratt's best works was the Eastern Railroad's Merrimac River Bridge at Newburyport, Massachusetts. The Merrimac bridge, completed in 1865, consisted of seven wooden Pratt trusses and a center draw span of iron (ASCE 1876:334-335; Cooper 1889:11; Johnson 1929:179).

In its wooden form, the Pratt truss never attained the popularity of the Howe design, but by 1889 in its iron form it ranked first in usage (Cooper 1889:11). The first all iron Pratt truss bridges were built by J. H. Linville for the Pennsylvania Railroad in 1850. Application of the Pratt truss in its original form reached a high point with the construction of the Erie Railroad Bridge at Portage New York in 1875, and the Cincinnati Southern Railroad Bridge at Cincinnati in 1876, both early landmarks in railroad bridge engineering. Literally thousand of bridges, both highway and railroad have been built following the Pratt design or some variation (Condit 1960:111,112,302).

REFERENCES CITED

- Adkins, Joyce S., Susie A. Lucado, and N. Wesley Adkins
1989 *History of Iron Gate, Virginia, 1889-1989*. American Heritage Publishing
Company, Inc., Marcelline, Missouri.

Alleghany County Supervisors Papers

1894-97 Box 419. Packet of paper manuscripts labeled "McPherson Ford Bridge Matter" and "Final Order May 8, 1897". Contains correspondence between Board members, engineers, and contractors, bridge commission reports, contracts, plans, petitions and other valuable information relating to bridge planning and construction. On file at the Alleghany County Courthouse, Covington, Virginia.

Alleghany County Board of Supervisors Order Books

1896-1917 Volumes 2-4. On file at the Alleghany County Courthouse, Covington, Virginia.

American Society of Civil Engineers

1876 Memoir of Thomas Willis Pratt. *Proceedings of the American Society of Civil Engineers*, vol. 1, 1873-1875, pp. 332-335.

Arritt, Gay

1982 *Historical Sketches of the Alleghany Highlands*. Edited by Horton P. Beirne. Published by the Alleghany Historical Society, Covington, Virginia.

Boye, H.

1825 Alleghany County. Manuscript sketch map surveyed and drawn under the direction of H. Boye. Framed document hanging on the wall at the Alleghany County Courthouse, Covington, Virginia.

Clifton Forge Review

1897 "The New Bridge." *Clifton Forge Review*, Clifton Forge, VA. Friday, February 12, 1897. Vol. 7, no. 40, p. 1, col. 4. Available on microfilm at the Charles P. Jones Public Library, Covington, Virginia.

Condit, Carl W.

1960 *American Building Art, The Nineteenth Century*. Oxford University Press, New York.

Cooper, Theodore M.

1889 American Railroad Bridges. *Transactions of the American Society of Civil Engineers*. Vol. 21, no. 418, July 1889.

1896 *General Specifications for Steel Highway Bridges and Viaducts*. New revised edition, 1896. Engineering News Publishing Company, New York.

Corron, Elizabeth H.

1971 *Clifton Forge Virginia: Scenic, Busy, Friendly*. Alleghany Publishers (no place of publication given).

McPHERSON'S FORD BRIDGE
(Bridge No. 6064)
HAER No. VA-104 (Page 18)

Deibler, Dan

1973 *A Survey and Photographic Inventory of Metal Truss Bridges in Virginia, 1865-1932*. Virginia Department of Transportation Research Council, Charlottesville, Virginia.

Fincastle Herald

1893 "Northern Botetourt, Upper James River." Reprinted in *Botetourt County History Before 1900 Through County Newspapers*, p. 73. Number 1 in Botetourt's History Series of Four Publications, Botetourt County American Bicentennial Commission, Fincastle, Virginia.

Hensley, Barbara E.

1979 "A Boulevard for Bessemer - A Century Later." In *Backsights*. Number 51, June 1979, pp. 14-16, 26.

Johnson, Allen, (editor)

1929 *Dictionary of American Biography*. Charles Scribner's Sons, New York.

Morton, Oren F.

1923 *A Centennial History of Alleghany County Virginia*. Originally published in 1923 by J.K. Ruebush Company, Dayton, Virginia; reprinted 1970 by C.J. Carrier Company, Bridgewater, Virginia.

United States Geological Survey (USGS)

1986 *Clifton Forge, Virginia*. 7.5-minute topographic quadrangle, 1962 edition photorevised to 1986. Geological Survey, United States Department of the Interior. Washington, D.C.

Virginia Department of Transportation

1976 Original Bridge Report, Bridge No. 6064. Virginia Department of Transportation, Staunton District Bridge Office, July 26.

McPHERSON'S FORD BRIDGE
(Bridge No. 6064)
HAER No. VA-104 (PAGE 19)

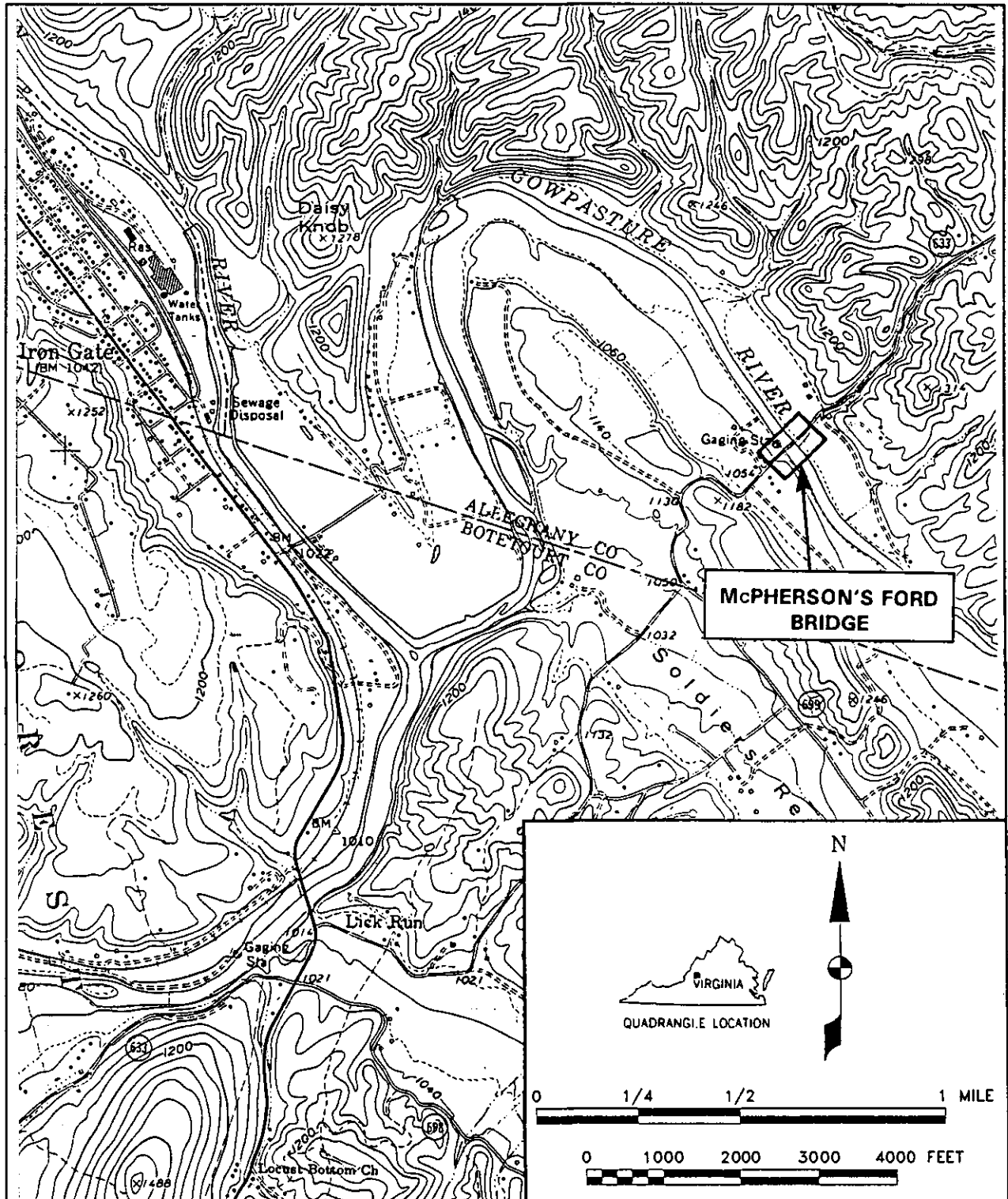


FIGURE 1: Location Map

SOURCE: USGS Clifton Forge, VA, 7.5 Minute Quadrangle, 1962
(Photorevised 1986)