A SURVEY AND PHOTOGRAPHIC INVENTORY OF METAL TRUSS BRIDGES IN VIRGINIA 1865-1932

VII. The Salem Construction District

by

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Virginia Highway & Transportation Research Council
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PREFACE

In 1974 the Research Council initiated a statewide survey of metal truss bridges to identify any with historic significance. This pioneering effort was financed with state research funds, as it was intended to aid the Virginia Department of Highways and Transportation in meeting its obligations mandated by various requirements of the environmental review process. Survey reports for the Staunton, Culpeper, Richmond, Fredericksburg, and Lynchburg construction districts have been published.

As the work in Virginia proceeded, interest in historic significance of bridges developed nationwide and warranted funding of the research under Highway Planning and Research funds administered by the Federal Highway Administration. A working plan was approved to develop criteria for the preservation or adaptive use of bridges and this work included surveys of metal truss bridges in the Lynchburg and Bristol districts and a statewide survey of concrete and masonry bridges. The surveys of metal truss bridges for the remaining two districts, Salem and Suffolk, were funded with state research funds. An interim report entitled "Criteria for Preservation and Adaptive Use of Historic Highway Structures — A Trial Rating System for Truss Bridges" was issued in January 1978.

This present report presents the results of the survey of the metal trusses in the Salem District. The issuance of this report and those for the remaining two districts has been delayed because of the resignation of the research analyst originally assigned to the project. The survey results were available and were considered in the development of the trial rating system.

ACKNOWLEDGEMENTS

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INTRODUCTION

It is a notorious fact that there is no country of the world which is more in need of good and permanent Bridges than the United States of America....Public spirit alone is wanting to make us the greatest nation on earth; and there is nothing more essential to the establishment of that greatness than the building of Bridges, the digging of canals, and the making of sound turnpike roads. Necessity has already produced some handsome and extensive specimens of bridge building in the United States.

Thomas Pope, as quoted above in his Treatise on Bridge Architecture of 1811, was pointing ahead to the importance of transportation development in our nation's history.(1)

The truss bridge was developed in direct response to the evolution and growth of America's transportation network. Its significance was recognized early. In 1916, prominent bridge engineer James Waddell wrote that the last form of bridge construction to be evolved but the one destined to promote the highest development of the art of bridge building was the truss.(2) Developments in technology are mirrored in its changing form. As materials changed from wood to combined wood and iron, to cast and wrought iron, and finally to steel, the truss bridge form reflected responses to needs for greater load and span capacity, mingled with manufacturing improvements in first irons, then steel. As current needs escalate load and traffic volume requirements, and highway safety standards are foremost in importance, the metal truss bridge is rapidly disappearing.

This report is a continuation of the Virginia Highway and Transportation Research Council's documentation of Virginia's remaining metal truss bridges,(3) a part of a research project delving into the technology of Virginia's historic transportation network. In particular, the results of the truss survey for the 12-county Salem District (Figure 1) are presented. In keeping with the previous reports of this series, the results are considered in light of historical trends.

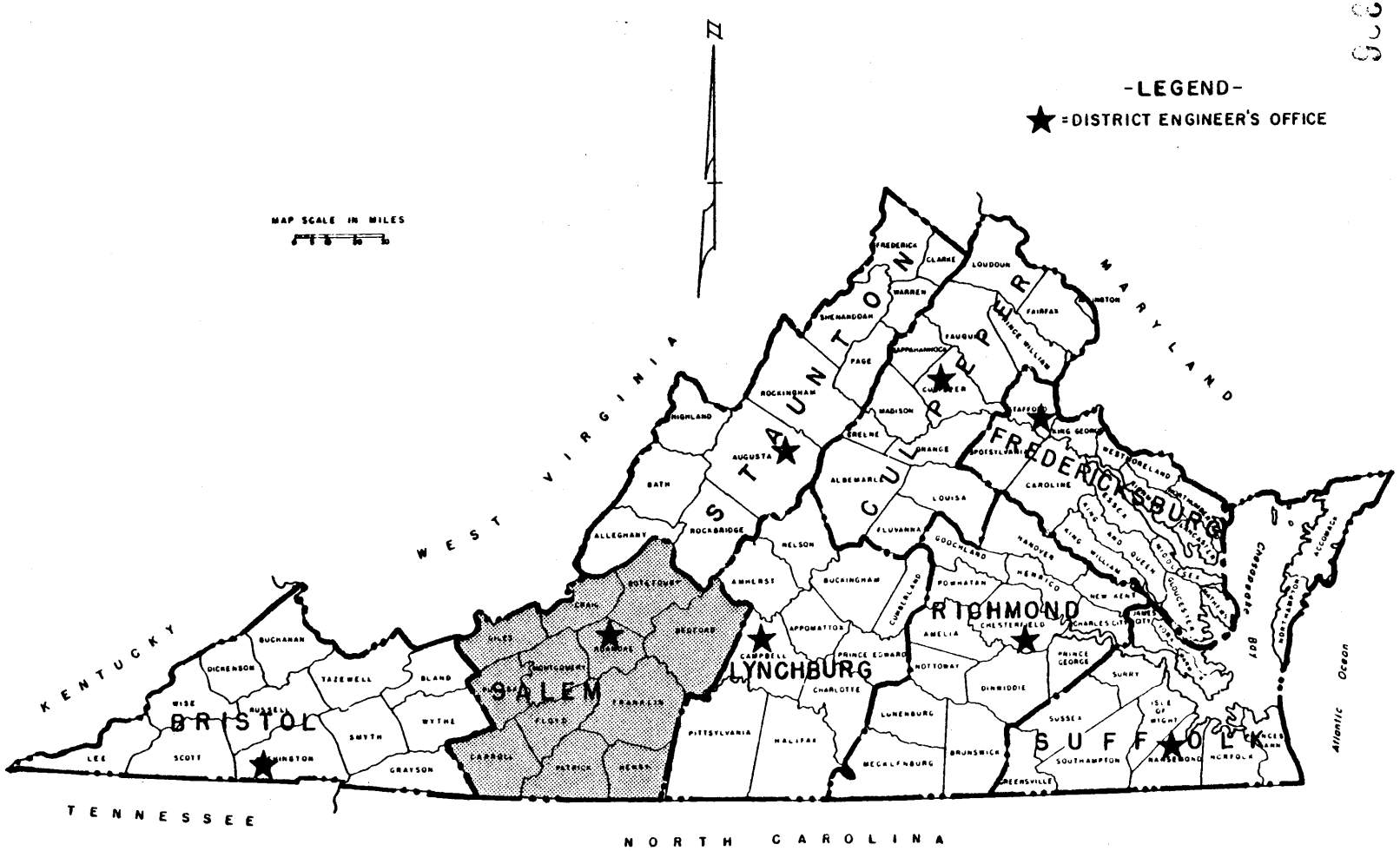

Figure 1. The Salem Construction District.

The study was confined to pre-1932 bridges because after this time Virginia's bridge design for its secondary road system was no longer on a county-by-county basis and centralization meant a loss of regional diversity and an increased tendency to standardization.

THE SALEM CONSTRUCTION DISTRICT

The Salem District comprises 12 counties which stretch from the West Virginia line to the North Carolina line. It is rich in historical, as well as topographical, interest. Notable historical examples include Virginia's century-long attempt to connect its eastward and westward flowing rivers, the James River and Kanawha Canal, which terminated westward at Buchanan. From there, several major roads were extended, including the Kanawha and the Southwestern Turnpikes. Among the many long established routes which traverse this district are Rte. 11 and Rte. 460. As early as 1753 a journal of the Moravians crossing from Pennsylvania to North Carolina described their journey from Buchanan, through Troutville, and then on to Roanoke and Martinsville.(3) This Route roughly paralleled today's Rte. 11 and Rte. 220. An east-west stagecoach route from Salem to Petersburg followed the line of present Rte. 460.(4) Other major roads in the Salem District are Interstate 81, Rte. 24, Rte. 40, and Rte. 58.

The scenery ranges from tobacco fields to the Peaks of Otter, from pristine countryside to abandoned boom towns. Though most of these boom towns faded into oblivion, two, Roanoke and Bessemer, are significant for this report. The District's major urban area, Roanoke, stands as a successful example among the many prospective late nineteenth-century boom towns. The decision to locate the junction of the Shenandoah Valley Railroad and the Norfolk & Western Railroad at "Big Lick" in 1881 resulted in what became the prosperous city of Roanoke. The town, located at an old salt marsh where several Indian trails converged, grew at a fantastic rate as it attracted speculators and industries. From a population of 700 in 1881 it mushroomed to a city of 5,000 by 1883.

Bessemer, on the other hand, did not prosper. It is situated on the abandoned Craig Valley subdivision of the C & O Railroad, a railroad spur built in the 1890's. Two remarkable Phoenix Company bridges, several undocumented through Pratt trusses, and a trimodal bridge remain standing on this railroad line. These are among the many unusual truss bridges in the Salem District.

A large number of metal truss bridges remain standing in the Salem District. The total number of metal truss bridges surveyed in the District is 145. Most truss categories, defined and used in the previous reports, are represented. The predominant type, however, is the Pratt truss, which constitutes 55% of the total, including low and through trusses. The diversity of bridge types represented in the District, as well as the number of bridge companies responsible for manufacturing the trusses, are good illustrations of the pre-1932 diversity in Virginia's bridge types (Table 1*). Not only is the District rich in the number of extant metal truss bridges, there are also many trusses which are historically significant.

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*Tables are given on pages 32 through 61.

As previously noted in the Lynchburg District report, two of Virginia's three remaining composite wood and iron truss bridges are located in the Salem District, one at Springwood and the other at Eagle Rock (see Figures 2 and 3). The dating and construction of these bridges are well documented. In May 1883 the Richmond and Alleghany Railroad Company made an agreement with the Botetourt County Board of Supervisors to build these two bridges over the James River. The agreement called for trusses of iron and wood on stone masonry piers to be built above the high water mark of 1877 and "materials and work to be first class". The specifications called for "strain in iron members to be. . .12,000 pounds per square inch" and "wooden compression members to be proportioned according to C. Shaler Smith's modification of Gordon's formula with a factor of safety of seven".(5) That these bridges continued in service for so many years attests to the quality of materials, workmanship, and maintenance. They are still standing, all truss spans and piers intact, but they are no longer in use. The Springwood composite truss was placed on the National Register of Historic Places in April 1978 and the Virginia Register in November 1977. The Eagle Rock bridge is on an abandoned road, is not under Department jurisdiction, and has not been nominated to either Register.

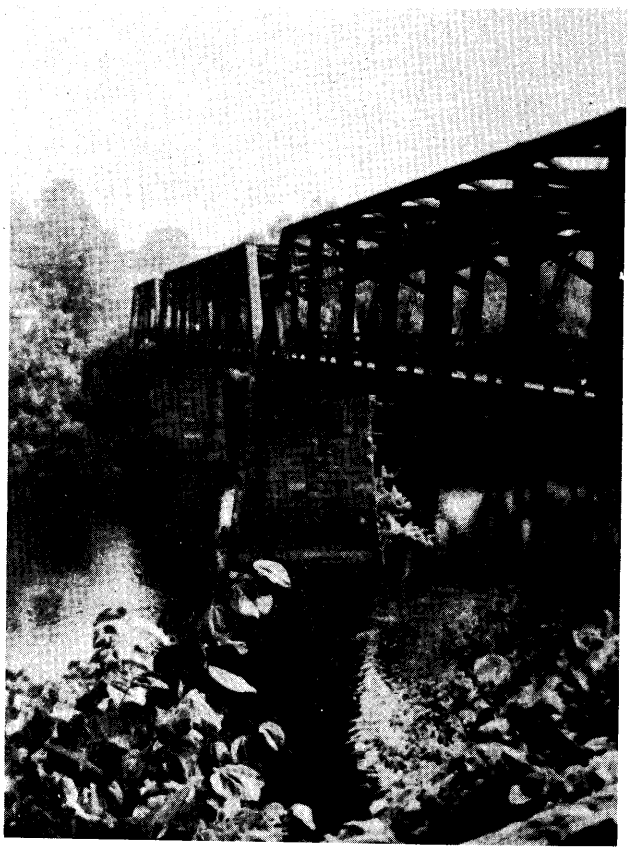

Figure 2. Composite wood and iron Pratt trusses located at Springwood. (Botetourt Co., photo. #12455-39-10)

Figure 3. Richmond & Alleghany Railroad wood and iron Pratt truss bridge at Eagle Rock. (Botetourt Co., photo #12455-36-1A)

Each of these composite bridges is made up of three Pratt trusses which are slight modifications of Thomas and Caleb Pratt's original patent for a wood and iron truss. As seen in Figure 4 their 1844 design originally called for top and bottom chords of wood, verticals of wood, and diagonals of iron. All three Virginia combination bridges have iron bottom chords. This modification of the design makes better use of the material properties as iron is more appropriate for the bottom chord subject to tensile forces.

In 1889 Theodore Cooper listed the advantages of combination bridges as being cheaper than all-iron bridges and more permanent than all-wood bridges. He claimed that wooden members were "less liable to destruction from fire and decay where the timber is only used in compact forms and under compressive strains".(6) In addition to lower material costs, this type of bridge was economical because it was usually designed so iron members could be reused, if necessary. While the Pratt truss evolved into a form primarily used in all-iron bridge design, the composite Pratt truss remained popular into the twentieth century. Milo Ketchum, in his 1908 book on bridge engineering, cited continued use of the combination Pratt truss for areas where wood was still a predominant bridge building material.(7)

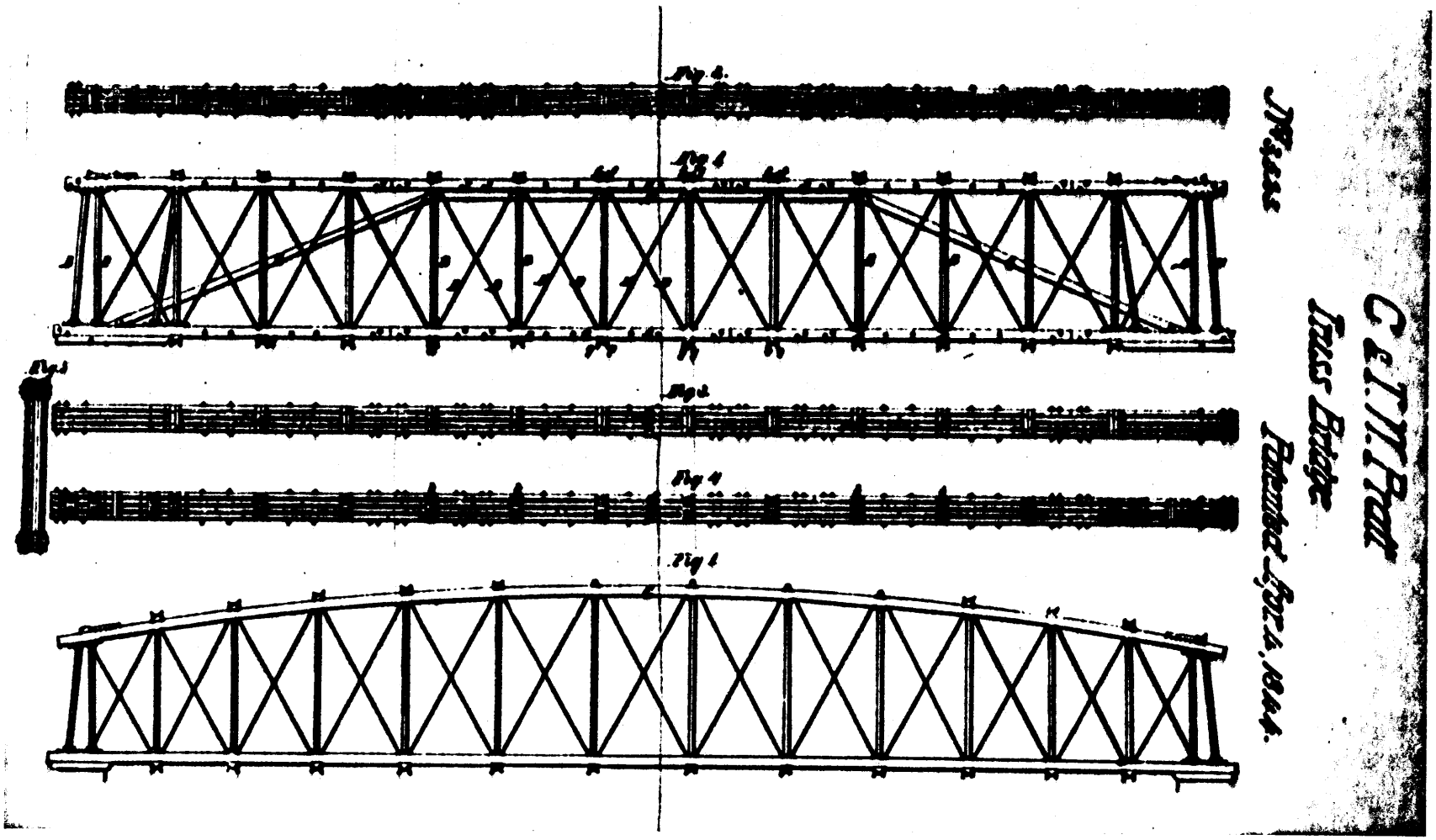

Figure 4. Thomas & Caleb Pratt's 1844 patent for a combination wood and iron truss bridge. (U.S. patent #3523)

Virginia's composite Pratt spans are significant primarily as extant examples of a stage in truss evolution. This type of truss continued in use alongside more progressive forms. By 1885, when these trusses were completed, all-iron truss bridges frequently were built from standard rolled sections. Technological improvements at that time in the United States were quickly leading to the exclusive use of structural steel in bridge building. The truss form was continuing its evolution in response to greater load demands from increasing railroad traffic and better knowledge of materials testing and structural analysis.

The Pratt truss became the predominant form for the iron truss. Its configuration changed in response to increased understanding of structural analysis. Before 1875 it was understood that double diagonals made a truss indeterminate. To accommodate this knowledge, the system of single diagonals evolved cautiously. First, there was only one diagonal in the two end panels. Double diagonals were excluded progressively from the other panels until only the center two panels had double diagonals. Finally, the system of single diagonals in all panels emerged,(8) although local variations in the form continued.

Alongside the Pratts' development of their truss was Squire Whipple's patent in 1841 for a bowstring arch. His design was like the Pratts' truss except the top chord arched from the left end to the right end of the bottom chord, giving an arched rather than trapezoidal profile. The bowstring type of truss varied in form as new components and materials were developed, and numerous patents reflected even slight improvements.

The bowstring truss, then, represents one of many diverging attempts in the nineteenth century to design a satisfactory truss bridge form. Among the many variations in design was Zenas King's 1861 patented improvement for tubular arches of rectangular cross section. This design consisted of an upper chord of varying cross section, a "tie-beam" bottom chord, and "radial rods" connecting them. King improved his 1861 tubular arch design and received a new patent in 1866. The upper chord was a built-up section, the lower chord was composed of two parallel rods, and the two chords were connected by vertical rods and diagonal bracing. King's 1866 patented bowstring truss is illustrated in Figure 5.

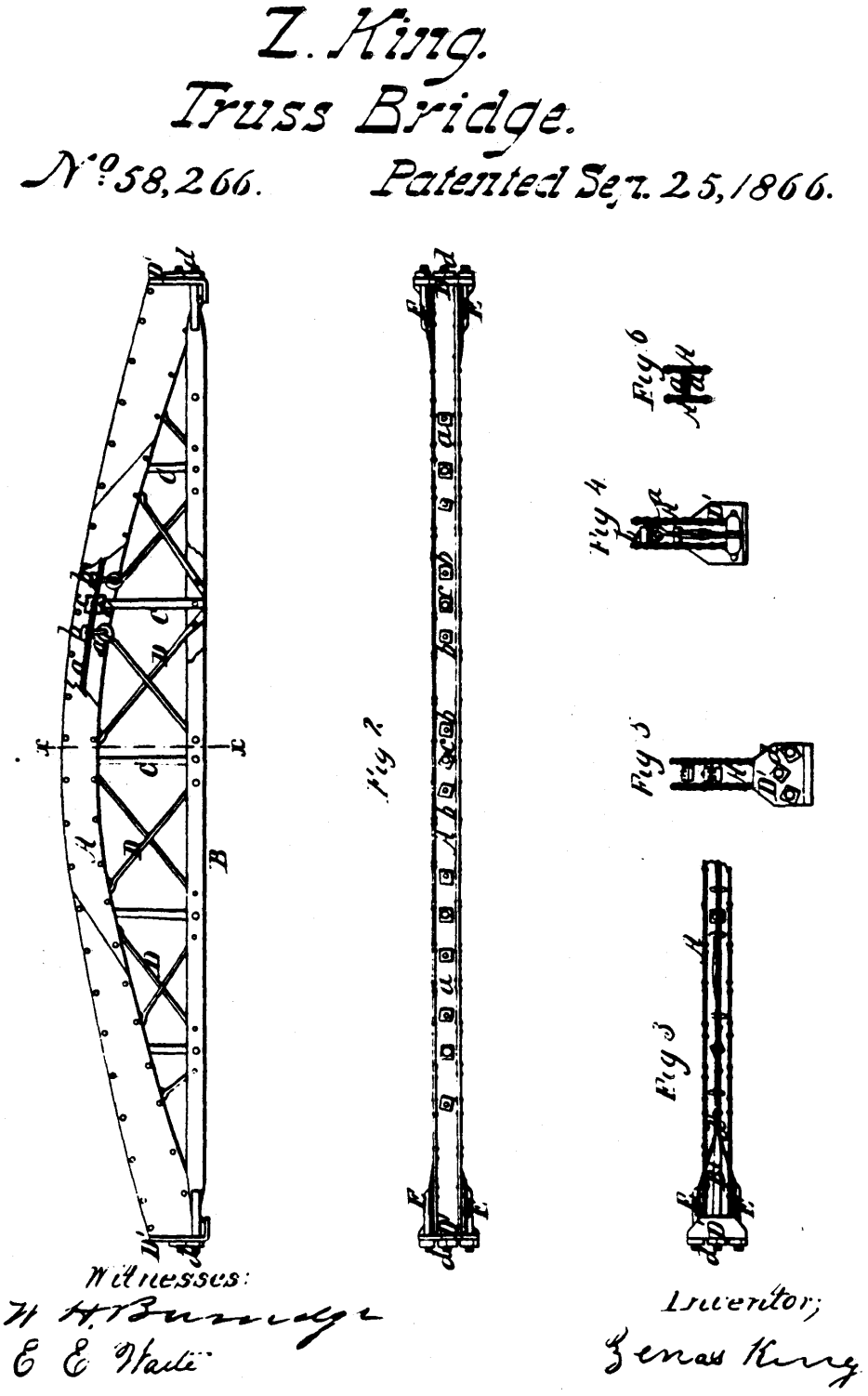

Figure 5. Zenas King's 1866 improved patent for tubular arches of rectangualr cross section. Virginia's bowstring truss, built by King's iron and bridge company and illustrated in Figure 6, conforms to this design. (U. S. patent #58,266)

Several bowstring trusses, built after King's improved 1866 design, were erected in Virginia. Only one remains. Originally located in Bedford County, this bowstring truss is Virginia's oldest extant metal truss bridge (see Figure 6). Although it is no longer in service as a vehicular bridge, it has been preserved and moved to the Ironto wayside on Interstate 81 in Montgomery County and will be enjoyed by travelers as a pedestrian bridge at the rest area. This Salem District span was completed in 1878 by the King Iron & Bridge Company of Cleveland, Ohio, founded in 1858 by Zenas King. In its 1884 catalogue, the King Iron & Bridge Co. claimed to be the largest highway bridge works in the U. S. The company also listed bridges they had actually built and included 15 in Virginia; among those were 6 tubular arches spanning from 80 feet to 170 feet in Bedford County. This list corresponds with Bedford County records of December 11, 1877. After the disastrous flood of November 1877 numerous bridges in Virginia needed to be replaced. County records show that the King Iron & Bridge Co. proposed and was awarded contracts for 6 bridges "to be built of S. King's latest improved patent of Wrought Iron Arch bridges, at the price of ten thousand, eight hundred and fifty dollars...."(9) The remaining span is the smallest one and was originally built at Davis Mill. It is the only bowstring truss left in Virginia.

Figure 6. Virginia's oldest extant metal truss bridge, the relocated Bedford County bowstring truss. This King Co. truss is now located in Montgomery County and is used as a pedestrian bridge. (Montgomery Co., photo #11916)

County records show that one of these bowstring trusses was built at Joppa Mills across Goose Creek. Now crossing Goose Creek at Joppa Mills on Rte. 747 in Bedford County is the only true bedstead/leg truss surveyed in the state (see Figure 7). The vertical endposts of the bedstead truss give it a rectangular profile. What makes it unique is that it is supported on steel legs rather than resting on piers and abutments, giving the truss the appearance of being on stilts. District records confirm site evidence that this truss was moved here. According to a local landowner, an old arch preceded this span and was washed away in a flood, and a wooden bridge preceded the arch. This bedstead truss was altered to suit its present site requirements when moved from the Big Otter River. Only two legs remain on the west end of the truss where the abutment was washed out; on the east end the abutment remained intact and the truss legs were shortened and bolted to the concrete reinforced old rock abutment. In 1908 bridge engineer Milo Ketchum warned that unless this type of truss was "very carefully designed and constructed" it was not recommended for two particular reasons: First, the legs must be designed to carry the thrust of the filling and live and dead load on half the span; second, this type of truss should be built with very stiff lower chords designed to take the thrust due to the filling.(10) Bedford County's bedstead truss is made of pin-connected eye bars and laced channels. The bottom chords are more heavily structured than usual; eye bars are backed up with angles and stay plates.

Figure 7. The only true bedstead/leg truss surveyed in Virginia, located in Bedford County. (Bedford Co., photo #12455-14-2A)

Another truss bridge built and designed by the King Iron Bridge & Manufacturing Co. spans the north fork of the Roanoke River in Montgomery County. The bridge date plate is intact on the portal strut and identifies the date of manufacture as 1892 by the King Iron Bridge & Manufacturing Co. of Cleveland, Ohio. Unlike the other King Co. bridge in the Salem District, this bridge is a pin-connected through Pratt truss spanning 105 feet (see Figure 8). In its 1884 catalogue, the King Co. illustrated the diversity of its manufacturing abilities. Among the many claims, it asserted that its shop had the capacity for wrought iron and steel bridges, high and low trusses, arch bridges, swing bridges, iron turntables and combination bridges of all styles. This Pratt truss was built by the King Co. for another site and moved to this one. The practice of dismantling truss spans and reerecting them at new sites has been observed throughout Virginia in the truss bridge survey. Relocated trusses are identified by bolted splice plates on the top chord. They confirm historical accounts of the ease of erection of the truss bridge. Not only was this bridge type easy to erect initially at a remote site but it could be removed, replaced by a bridge with greater load capacity, and reerected on a road with lighter traffic demands. There are many examples of relocated truss bridges throughout Virginia.

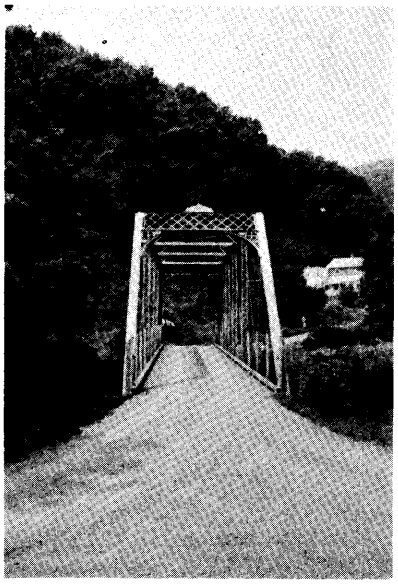

Figure 8. King Iron Bridge & Manufacturing Co. Pratt truss, with bridge plate intact, built in 1892. (Montgomery Co., photo #12455-9)

In Henry County there is a multiple span bridge which is unusual for this reason. Each span of this five-span bridge came from a different site (see Figure 9). All were assembled together in 1953 by the Department to make the bridge over the Smith River. There are two truss and three steel beam spans. The pin-connected Pratt through truss of this conglomerate bridge was built in 1887 and originally carried Rte. 58 in Pittsylvania County. Its heavy portals and sway bracing give it the look of a later truss. The other truss is a triangular pony truss, also originally located on Rte. 58. The girders were brought from the Roanoke area.

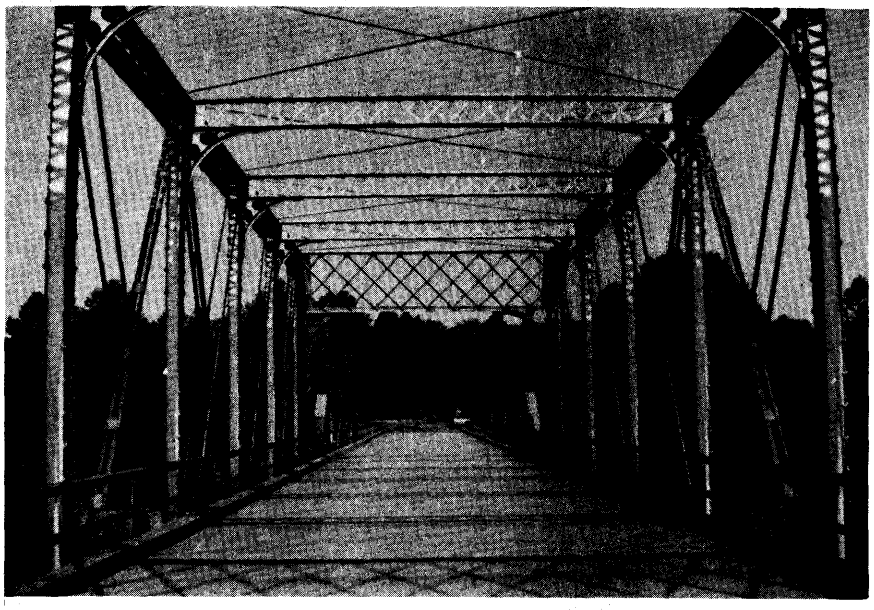

Figure 9. Multiple span bridge in Henry County erected of five relocated components, one of which is an 1887 pin-connected through Pratt truss. (Henry Co., photo #12455-16-5)

Four Pratt trusses together span the Little River in Montgomery County, comprising one of Virginia's few multiple span truss bridges still located on its original site (see Figure 10). These spans were made and erected between 1916-1918 by the Champion Bridge Co. of Wilmington, Ohio, for the Virginia State Highway Commission. There are two through Pratt trusses of 102 feet and two pony Pratt trusses of 53 feet. All have riveted connections.

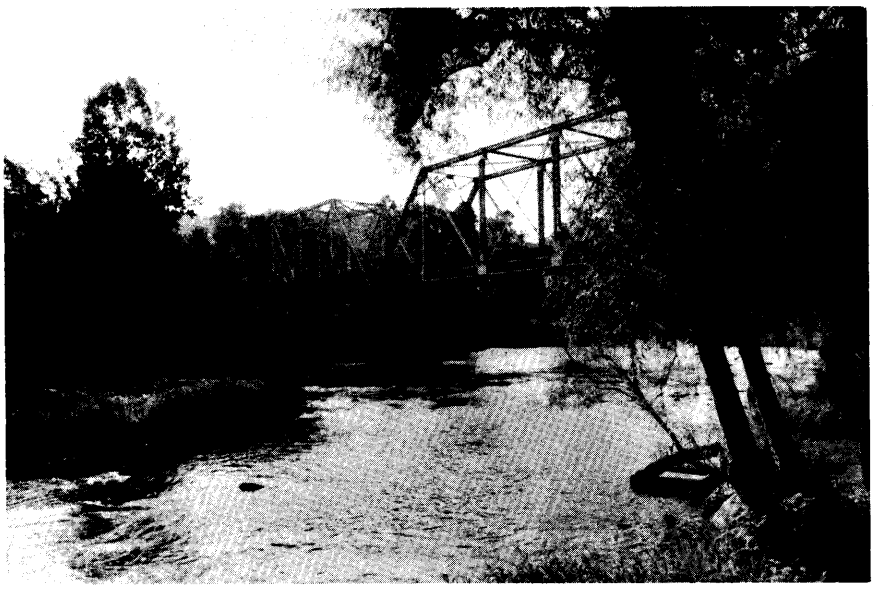

Figure 10. These Champion Bridge Co. Pratt trusses comprise one of Virginia's few multiple span bridges located on its original site. (Montgomery Co., photo #12455-26-18)

According to bridge engineer Waddell's historic commentary, the most prevalent types of truss used after the Civil War were the Pratt and Whipple trusses.(11) The Pratt truss evolved in form and materials from a combination wood and wrought iron truss to an all-iron or steel truss. Its profile changed to accommodate longer spans. In addition to profile variations the relationship of roadway to truss could vary. The Pratt truss could be used as a high/through truss, a pony truss or a deck truss. In a deck truss the loads are carried on the top chord. Few deck trusses remain in Virginia. A typical example of a standard Pratt deck truss is still in use on Rte. 666 in Bedford County (see Figure 11). Built in 1915 by Roanoke's Camden Iron Works, under the Virginia State Highway Commission, this truss is on a road which was formerly a railroad bed for a line from Lynchburg to Tennessee. Joints are riveted to make a rigid deck which carries the roadway 110 feet across Elk Creek.

Figure 11. Pratt deck truss built in 1915 by Camden Iron Works of Roanoke, Virginia. (Bedford Co., photo #12455-10-18)

Variations in the Pratt truss profile included inclined top chords and subdivided panels. The Pennsylvania Petit truss in Giles County is a typical example of a commonly used truss type (see Figure 12). In 1916, bridge engineer Waddell claimed that "nearly all trusses of ordinary span length are being designed of the Pratt or Petit type".(12) To constitute a Petit truss, the main panels of a Pratt truss are subdivided by an auxiliary framework of inclined and vertical members. When the upper chords are inclined like a camelback Pratt truss, the Petit truss is called a Pennsylvania Petit truss. The Pennsylvania Railroad Co. introduced subdivided Pratt trusses, "Baltimore" trusses, on its system in 1871.(13) It later included trusses with inclined chords and subdivided panels on its railroad. The Giles County Pennsylvania Petit truss spans 170 feet. It is made of steel members which are pin-connected.

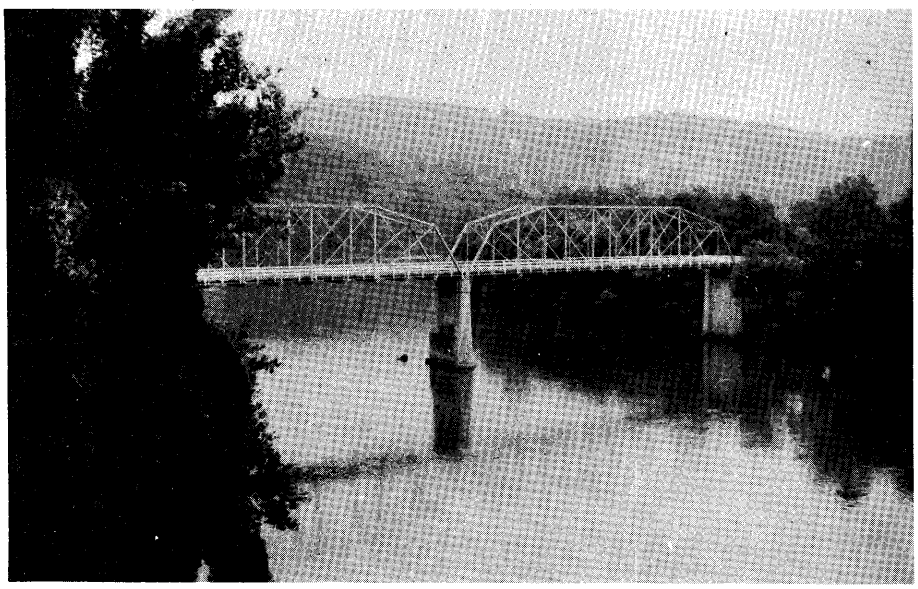

Figure 12. Two-span Pennsylvania Petit truss bridge in Giles County. The Petit truss was a commonly used truss type. (Giles Co., photo #12455-32-21)

Another unusually configured truss bridge is made up of three triangular-with-verticals pony trusses supporting a roadway built on a 3.0% gradient. The combination of sloping road and the difference in elevation of each truss gives the visual effect of a cascade (see Figure 13). The trusses are heavily structured, rigidly connected 1931 designs by the Virginia Department of Highways.

Two pony trusses which have carried traffic over the Roanoke River since 1890 are rare representatives of the Warren truss, without verticals, in Virginia (see Figure 14). These spans were built by the American Bridge Co. for the city of Roanoke. Although more low Pratt trusses remain in use today, bridge engineer Milo Ketchum recommended use of the low Warren over the low Pratt in 1908.[14] Cantilevered to either side of these trusses are pedestrian walkways embellished with scrollwork railings. The American Bridge and Iron Co. was founded in 1888 in Roanoke and was reorganized as the Virginia Bridge and Iron Co. in 1895.

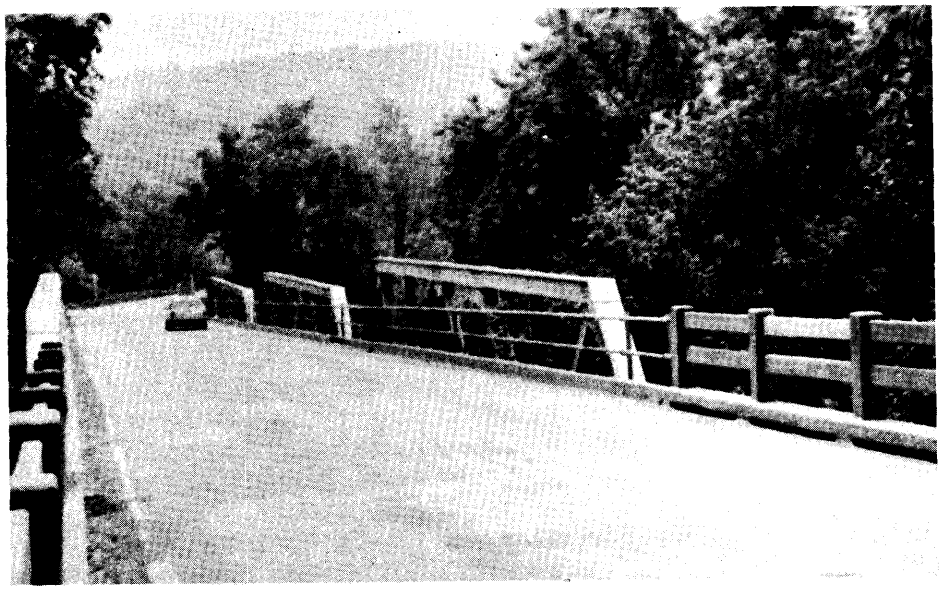

Figure 13. Three triangular pony trusses which support a roadway built on a 3.0% gradient. (Botetourt County, photo #12455-38-16A)

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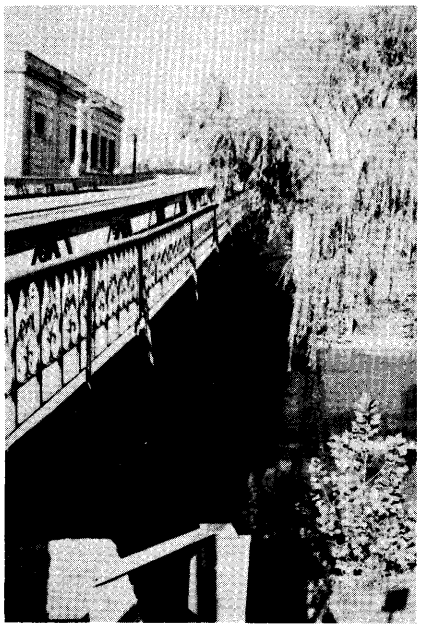


Figure 14. Two 1890 Warren trusses built by the American Bridge Co. of Roanoke. Note decorative scrollwork on side railings. (Roanoke Co., photo #12455-46-5)

Another unusual truss surveyed in Giles County is now abandoned as a vehicular bridge. It is one of Virginia's two examples of the quadrangular Warren truss described by Milo Ketchum.(15) He said that the quadrangular Warren truss with riveted joints was used as a standard truss for through highway bridges by the American Bridge Co. for spans of 80 to 170 feet. As Roanoke's American Bridge Co. went out of service in 1895, the American Bridge Co. referred to by Ketchum is most probably the division of U. S. Steel which absorbed a number of small bridge companies in the first few years of the twentieth century. This Giles County bridge is riveted and spans 162 feet (see Figure 15). The bridge plate is missing so it is impossible to confirm whether this bridge was manufactured by the American Bridge Co. Historic bridge engineer Waddell disclaimed the double intersection truss because of "unavoidable ambiguity in multiple-intersection trusses", high secondary stresses, and the high cost of fieldwork.(16)

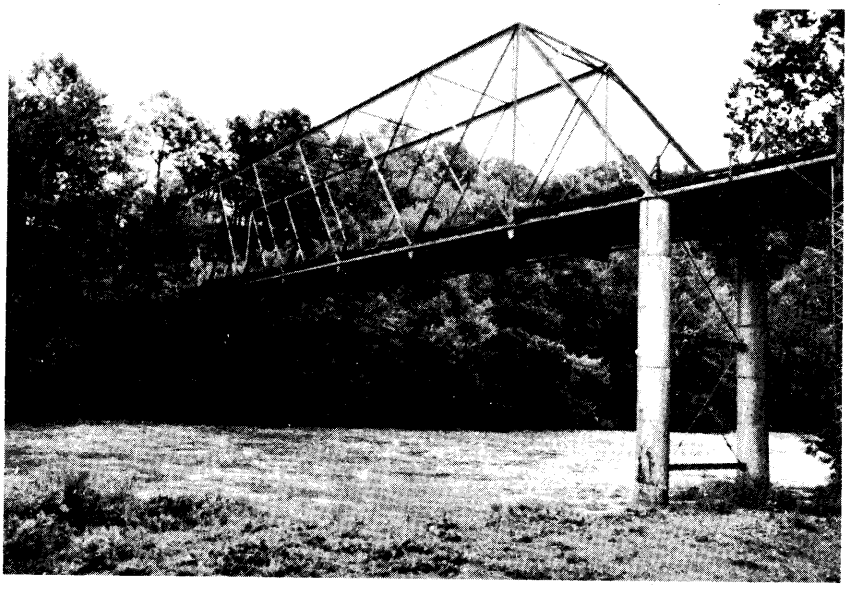


Figure 15. Double intersection Warren truss, or quadrangular Warren truss, located in Giles County. The joints are riveted and the bridge spans 162 feet. (Giles Co., photo #12455-28-17)

The unusually decorative truss on the cover was built in 1887 by the Phoenix Bridge Co. of Phoenixville, Pennsylvania. It is located in Botetourt County and, along with a Warren deck truss, spans Craig Creek. The bridge plate remains intact on the portal and verifies this truss's manufacturer and date of manufacture. The patented compression members, known as Phoenix columns, identify the manufacturer as well. The elements which decorate its portal struts give this Pratt truss a most appealing, almost elegant, character (see Figure 16). Adding to the unique appearance of Pratt's truss profile are the wrought iron Phoenix columns which are used for endposts, verticals, top chords, and lateral struts.

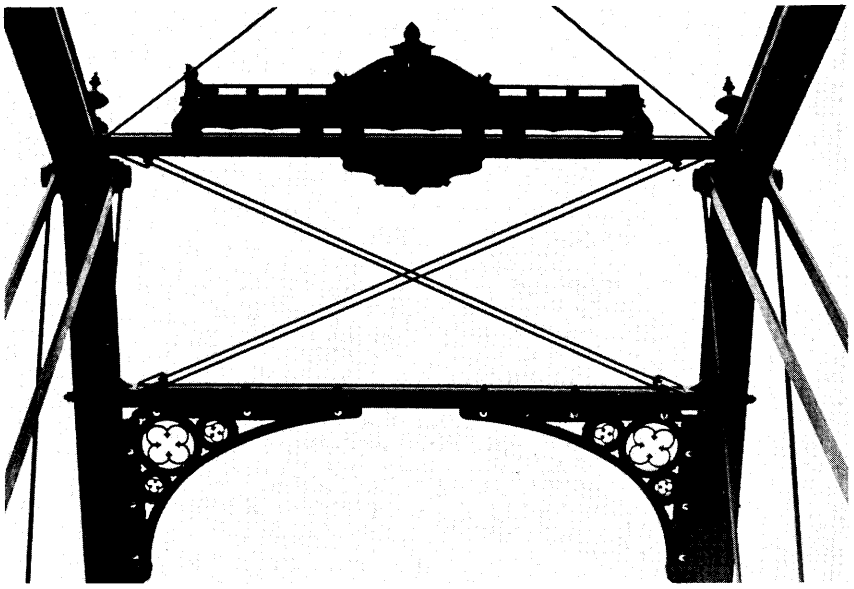


Figure 16. Phoenix Co. truss detail showing elegant decorative elements on portal bracing of this through Pratt truss. (Botetourt Co., photo #12925B-19)

When the Phoenix Bridge Co. introduced its Phoenix column in the 1860's, it was instrumental in shifting bridge building materials from cast iron to wrought iron, according to Waddell in 1916.(17) Samuel Reeves patented a wrought iron column in 1862. It was a composite column made up of three or more rolled flanged sections, longitudinally oriented and bolted or riveted together on the flanges to form a cylindrical compression member (see Figure 17). Several changes in column design were patented in 1872 by Thomas Clarke and Adolphus Bonzano of Clarke, Reeves & Co. The standard column used in their bridges, however, was described in the "2nd Illustrated Album of Designs" produced by the Phoenixville Bridge Works and Clarke, Reeves & Co. in 1873. Phoenix columns were "tubes made from 4 or from 8 sections rolled in the usual way and riveted together at their flanges."(18) Plate 15 of the album illustrated column sections of varying diameter and varying number of sections. Phoenix also advertised the fact that its column could be joined together with cast iron joint blocks, if necessary.

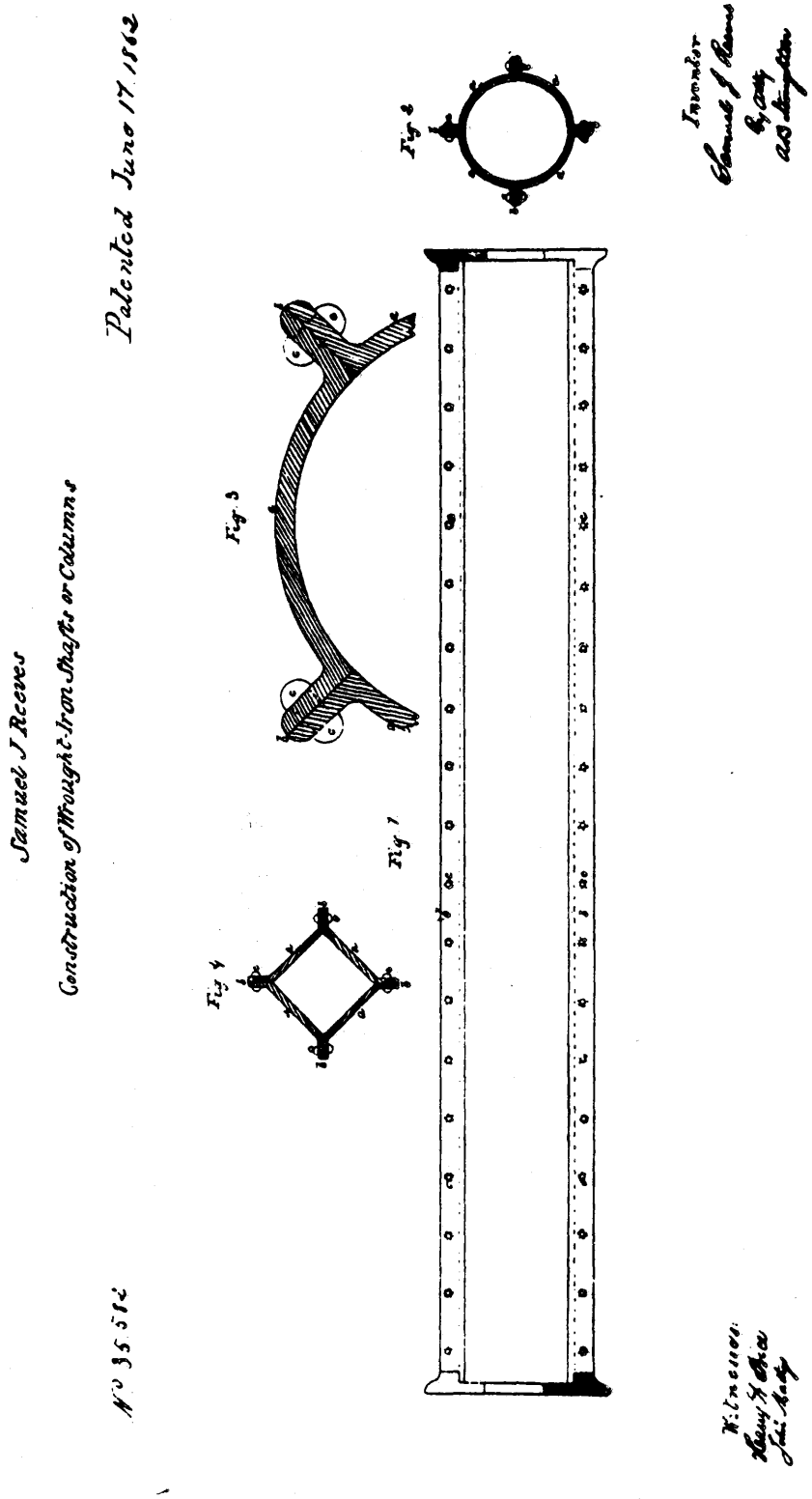


Figure 17. Samuel Reeve's patent for a composite column section. (U. S. patent #35582)

The increased area of this composite member made it stiffer and more able to withstand the buckling tendency of long slender columns. In addition to its compression member, this innovative company also developed the use of the hydraulic upset end for eyebars. This process was described in the previously cited album of designs:

> The heads upon the bars are made by a process known as forging. The bar is heated to a white heat, and under a die worked by hydraulic pressure the head is shaped and the hole struck in one operation.

The Phoenix Co. advertised its lead in truss-building technology in 1869, when it issued the first handbook on the use of iron sections for structural purposes. The Phoenix Co. joined the Keystone Bridge Co. in the forefront of American materials testing technology. In 1889, Theodore Cooper noted that previous to 1870 there were crude testing machines in these shops.(19)

This ornate Phoenix Co. Pratt truss was placed on the National Register of Historic Places in April 1978 and on the Virginia Landmarks Register in November 1977. Along with its companion Warren deck truss, it rests on rusticated ashlar piers and abutments. Because of its isolated setting on secondary Rte. 685, the reasons for erecting such a bridge substructure and superstructure remained a mystery until research at the Virginia Highway & Transportation Research Council discovered a local boom town plan (Bessemer) and a length of abandoned bed on the C & O Railroad sheltering a number of interesting truss bridges.(20) Two remarkable Phoenix Co. bridges, several undocumented through Pratt trusses and a trimodal bridge remain standing on this railroad line. Also, the remains of the westernmost lock of the James River and Kanawha Canal are located at Eagle Rock, a few hundred feet from the multimodal bridge.

The Chesapeake & Ohio Railroad Craig Valley subdivision began at Eagle Rock and crossed the James River on a five-span trimodal bridge. This is the only extant example of a multimodal bridge in Virginia (see Figure 18). Three of these spans are Pratt through trusses. Their decorative portal elements remain intact. To either side of the truss are cantilevered beams which supported smaller roadways for other modes of transportation. This truss is an example of the type described by bridge engineer Waddell in de Pontebus in 1898. He called them "combined bridges" and divided them into several categories.(21) Among these was the truss with a single track in the middle, a narrow footwalk on either side inside the truss, and cantilever brackets outside the truss to carry wagonways and electric railway lines. An examination of the detail photographs (see Figures 18 and 19) shows two brackets of different size and space for a small pedestrian walkway inside the intersecting post of the truss. With plans for a metropolis at Bessemer it is certainly possible that one of the cantilevered brackets was built for potential electric car service and one for wagons.

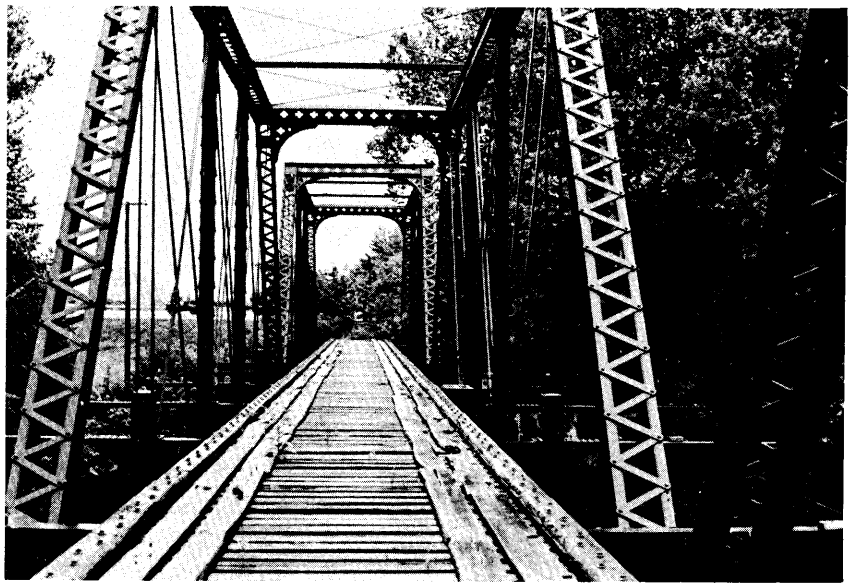


Figure 18. Trimodal truss bridge located on the abandoned C & O Railroad subdivision from Eagle Rock to New Castle. Three separated roadways were supported on this bridge, one through the truss and two on the cantilevered brackets outside the truss. (Botetourt Co., photo #12925B-22)

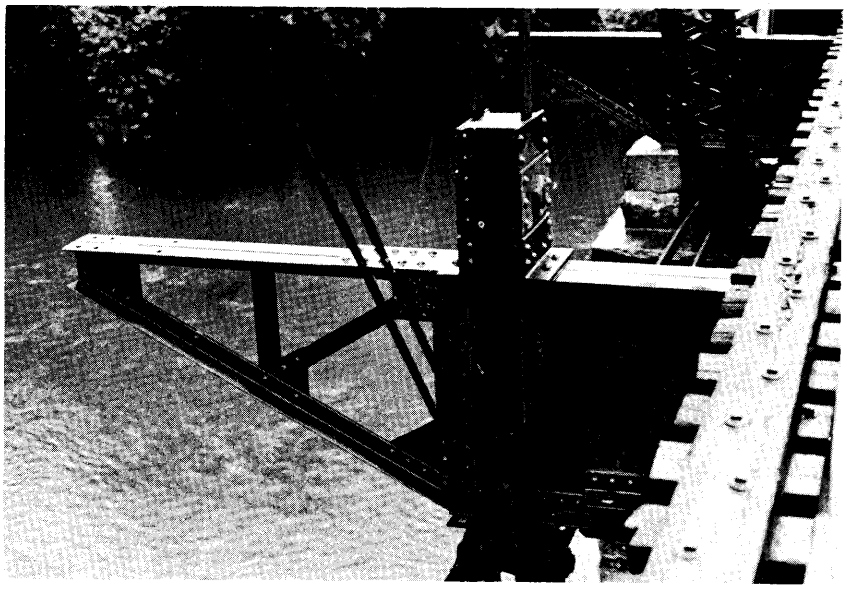


Figure 19. Detail of trimodal bridge in Figure 18 showing cantilevered beams which carried traffic on both sides of the truss. (Botetourt Co., photo #12925B-23)

All four through truss bridges on this abandoned railroad bed are Pratt trusses but all four are made of different components. Only the Phoenix through truss remains in use as a vehicular bridge, but all four are intact structurally. Figure 20 illustrates the variation in appearance possible in Pratt trusses made of different members. The date plate remains intact on one bridge and identifies it as a 1901 A. & P. Roberts Co. truss whose components were manufactured by the Pencoyd Iron Works of Pencoyd, Pennsylvania. The lower joint pin connections on this Pencoyd truss are clearly exposed because of the curiously curved beam shown in Figure 21. The other two bridges on this railroad bed are deck trusses and are on the end of the railroad line near New Castle. Parts of this bed correspond with Virginia secondary roads, and one of these deck trusses, a Phoenix truss, is being studied for reincorporation into the secondary system. This Phoenix deck truss is a remarkably deep and long spanning deck truss, using Phoenix columns for posts and some diagonals (see Figure 22).

Many of the Salem District trusses are undocumented with respect to date of manufacture (43%), so statistical conclusions must be made with that in mind. There are, however, 13 significantly early trusses, all built prior to 1890. In the time span from 1870-1910 there are 19 trusses; 13 are Pratt types, 2 are camelback types and 1 is a bowstring type. These figures confirm Waddell's observation in 1884 that 90% of all post-Civil War trusses were of the Pratt or Whipple type. By 1916, according to Waddell, nearly all trusses "of ordinary span length are being designed of the Pratt or Petit type, but occasionally the triangular with secondary verticals is employed".(22) His later observations are also confirmed by the 1910-1932 group of trusses: 37 of the 64 are Pratt trusses and the other 27 are triangular with vertical trusses. Including trusses of undocumented dates the breakdown of types is: 59% Pratt, 37% triangular with verticals, and 4% diverse (Table 1).

Forty-eight percent of all truss bridges in the Salem District are low/pony trusses, 42% are high/through trusses, and 10% are deck trusses. Only two of these deck trusses are Pratt trusses; the other 13 are triangular trusses. Figure 23 illustrates one of the few multiple span deck truss bridges in Virginia. The 5 triangular trusses of this bridge each span 114 feet and carry traffic over the James River in Botetourt County. Twelve of the 15 deck trusses in the District are located in Botetourt County. The average spans are 74 feet for the pony trusses, 123 feet for the high trusses, and 89 feet for the deck trusses. These figures all fit within the confines of Waddell's requirements:

65-90 feet	pin-connected pony truss
90-200 feet	pin-connected through truss
200 plus feet	pin-connected through truss with polygonal top chords

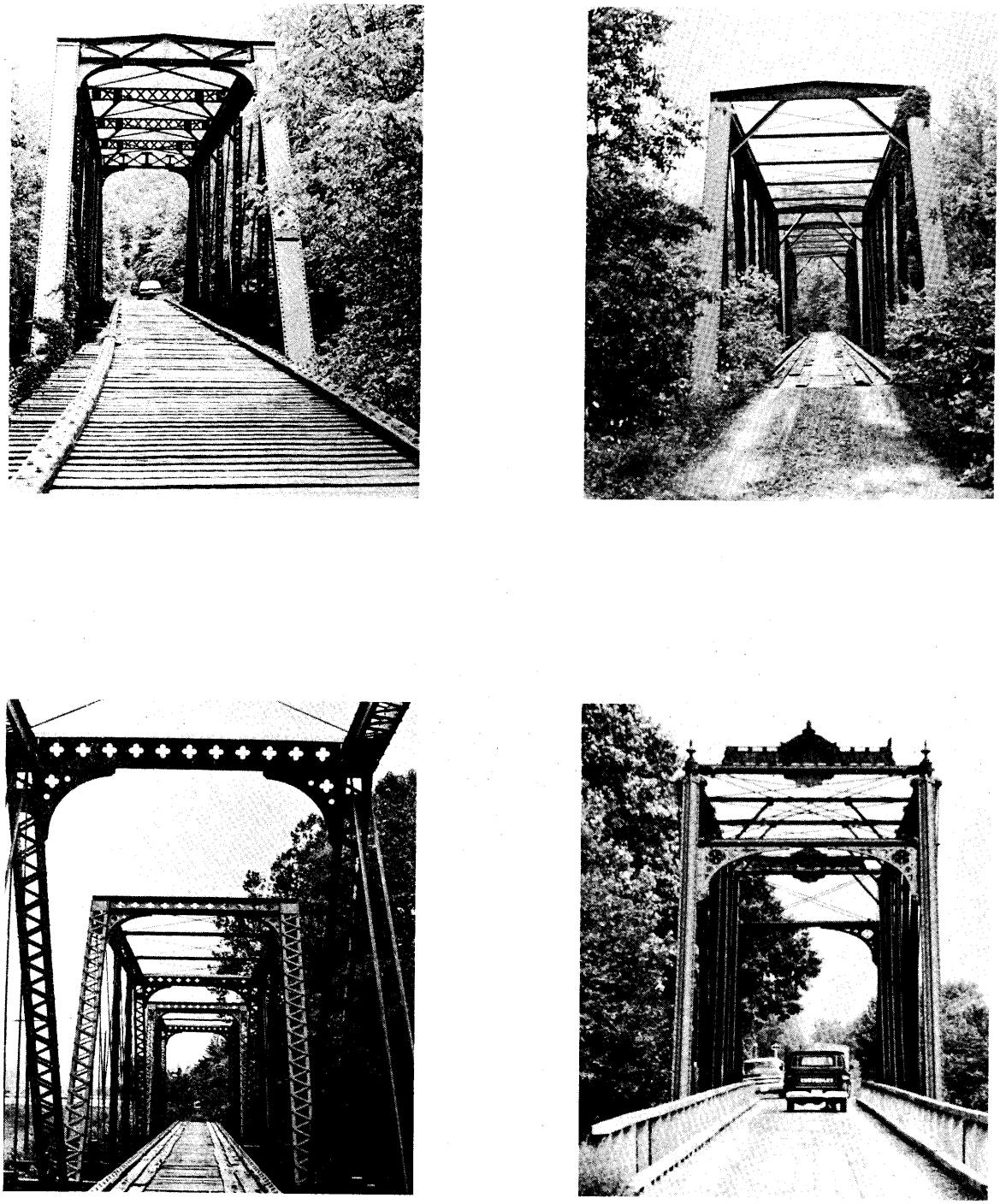


Figure 20. Four Pratt through trusses composed of different components illustrate the variation in appearance made possible by changing the elements which make up the same basic profile. All are located on the same railroad line. (Botetourt Co., photo #12925A-7, #12925A-14, #12455-36-15A, #12925B-21.)

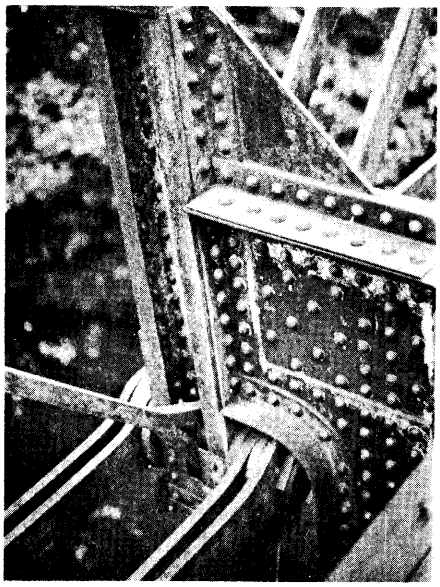


Figure 21. Detail of truss, upper left, in Figure 20 showing curved section which makes the pinned joint easily accessible. (Botetourt Co. photo #12925A-12)

Figure 22. Pin-connected triangular deck truss made of Phoenix columns, laced channels, and eyebars. (Botetourt Co., photo #12925A-5)

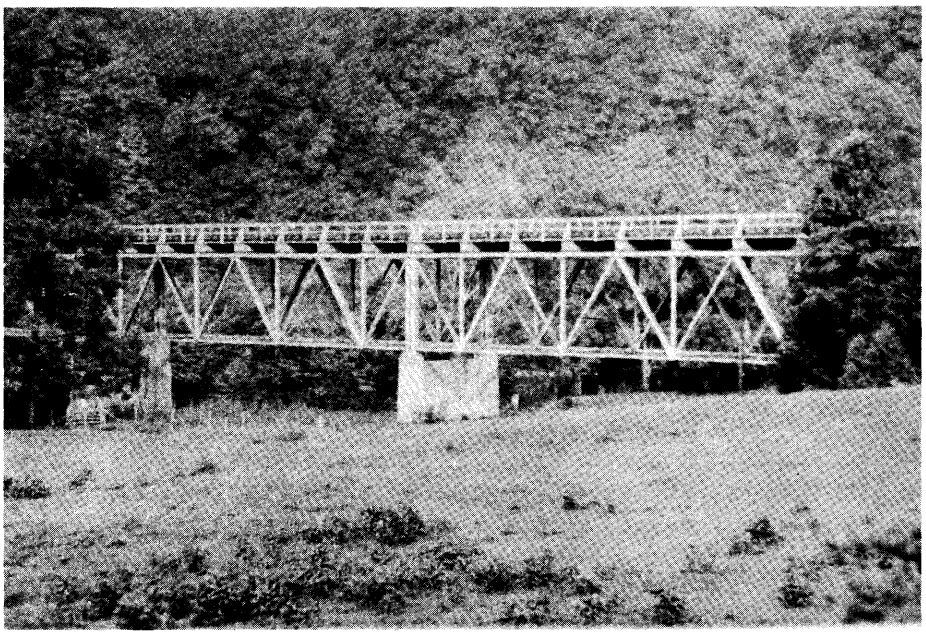


Figure 23. Five-span triangular deck truss in Botetourt County. This in one of the few multiple span deck trusses remaining in Virginia. (Botetourt Co., photo #12455-39-6)

Relating these categories to the trusses in the 1890-1910 group, the time which corresponds to the publication of Waddell's Bridge Engineering, gives figures which conform to Waddell's breakdown by span length. Three dated, pin-connected, Pratt pony trusses average 81 feet in length, 7 dated through trusses average 128 feet in length, and 2 camelback trusses (inclined chords) each span 167 feet. Two very early riveted triangular trusses deviate from this early classification and from Ketchum's 1908 specification for truss bridges. These 2 pony trusses are located in Roanoke, they are dated 1890, and each spans 80 feet. They seem to be an early use of the riveted pony truss in the state, as riveting was usually completed in the shop prior to the twentieth century. These bridges were manufactured by the local American Bridge Co., and the transporting and assembling of the already riveted trusses were not as difficult as a long distance shipment would have been.

Milo Ketchum proposed in 1908 that low truss bridges should be used for 30- to 40-feet spans and should always be made with riveted connections, unless great care was used in the design of pin-connected bridges.(23) Ketchum's principal objection to the pin-connected low truss was a lack of lateral stability due to insufficient bracing. He considered riveted trusses preferable for all low trusses and for high trusses up to 150 feet. He also specified that spans longer than 150 feet should be pin-connected, but all high trusses could be pin-connected. Ketchum's 1908 breakdown of high trusses was:

80-170 feet	parallel chords, either pin or rivet
160-220 feet	Pratt with inclined upper chords, pin
220 plus feet	Petit, pin

The survey results for high trusses in the 1911-1932 era generally confirm this breakdown. Pratt pinned spans range from 88 to 152 feet; the pinned camelback spans (inclined chords) range from 133 to 167 feet; the Petit trusses have no documented dates, but they are pinned and range from 170 to 200 feet. A listing of truss types in the Salem District, with respective joint connections, is given in Table 2.

Pin-connected trusses had a number of advantages: they were easily manufactured and transported to the site and they were lightweight and could be constructed quickly. However, they did not make a very rigid structure. As the pinned joints wore with age, moving loads caused increased vibratory motion. The development of the portable pneumatic riveter made riveted connections more feasible in the early twentieth century since riveting no longer had to be done in the shop. As seen in Table 2, 54 of the 59 dated trusses with riveted connections were built from 1911-1932 and 14 of the 25 dated trusses with pin connections were built from 1870-1910. Among the 63 riveted low trusses, about one-half are full-slope Pratt and the other half are triangular. Of the 17 riveted high trusses, 8 are triangular and 9 are Pratt. For the 51 pinned trusses, 44 were high trusses, 6 were low, and 1 was a deck truss. With so many undocumented dates among the pinned trusses (26 of 51), it is difficult to draw any conclusions on a historical basis. It is interesting, however, to note that there are several late uses of pinned connections in the district; 9 high trusses with pinned joints were built from 1915 to 1928. The data for joint connections in the Salem District are listed in Table 2.

The Salem District is represented by a diversity of bridge companies (Table 3); 85 of 145 trusses have documented designer-fabricators. These 85 trusses are represented by 14 companies and are scattered within the 12 counties. The location of several iron and bridge manufacturing companies in the cites of Roanoke and Salem, however, makes the design and fabrication of Salem District bridges appear slightly more centralized than

is the case in some other districts. The Roanoke Iron Works, Inc., Roanoke Bridge Co., Inc., Virginia Bridge & Iron Co., Virginia Bridge Co., Camden Iron Works, Atlantic Bridge Co., and American Bridge Co. were all established in Roanoke or Salem. The Virginia Bridge & Iron Co. was incorporated in 1895, having been previously the American Bridge Co.(24) Its principal product was heavy railroad bridge work. The Roanoke Bridge Co., Inc. was organized in 1906 for the construction of county and municipal bridge work. Until 1911 the Roanoke Bridge Co. worked together with the Virginia Bridge & Iron Co. The Roanoke Bridge Co. contracted for and erected the bridges in the field while the Virginia Bridge & Iron Co. fabricated the structural steel in its shops.(25) The Roanoke Iron Works, Inc., was established in 1907 as the consolidation of two large iron working enterprises in Roanoke.(26) The Camden Iron Works was established about 1887 and specialized in structural and ornamental iron.(27) In 1914, the Roanoke Bridge Co. of Roanoke and the Camden Iron Works of Salem merged to become the Roanoke Iron & Bridge Works.(28) Of the 145 truss bridges in this District, 53 were manufactured by these Roanoke or Salem companies.

The Phoenix Bridge Co., manufacturer of the elegant truss on the cover, is the most significant representative in the Salem District. The King Iron Bridge & Manufacturing Co. of Cleveland, Ohio, built two pre-1900 trusses, discussed above, the bowstring truss and a Pratt truss. The other nonlocal companies which erected trusses in the Salem District are the Atlantic Bridge Co. of Charlotte, North Carolina, the Champion Bridge Co. of Wilmington, Ohio, the Richmond & Alleghany Railroad of Richmond, Virginia, the A. N. Campbell Co. of Lynchburg, Virginia, and the A. P. Roberts Co. The breakdown of these companies within the district is detailed in Table 3.

By the late nineteenth century, all major bridge companies had their own shops and handled their bridge parts from the rolling mills to final shipment. Each of these large-scale companies had the shop capacity to handle bridge manufacturing from receiving the iron to straightening, punching, fitting, riveting, finishing, painting, and shipping.

The procedure by which a locality would contract to have a truss bridge erected was detailed in the 1873 catalog of the Phoenixville Bridge Works and Clarke, Reeves & Company. There are 14 plates in the back of the catalog which illustrate various styles of bridges available. Prospective bridge buyers treated the catalog much like today's mail order catalog customer does. The bridge company instructed its customers to "follow directions" and provide information concerning:

1. style of bridge, span length, width of piers

2. bridge at right angles, or angle of skew

3. height of bottom of rail above streambed

4. who will build substructure, railroad company or bridge company, and if bridge company, then

5. depth of water, if piles are required by nature of bottom of streambed.

When these data were furnished, the company promised to (1) "quote prices, by return mail" and, (2) "construct the bridges in as short a time as any other bridge builders can do".(29)

Their cash rates were uniform to all, but prices were lower if a number of trusses were ordered. Although their system encouraged the customer to choose one of their standard styles, they claimed to be able to "make special plans and estimates to suit any required case" for a higher cost.(30)

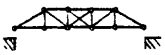
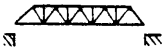
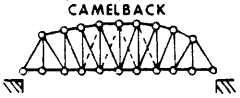
This procedure continued to be used by counties for highway bridges as vehicular traffic increased and more highway bridges were needed. In these cases, if the bridge company did not construct the substructure, the county did. The metal truss bridge continued to be a popular bridge form well into the twentieth century because of the relative ease of construction methods and the tendency of the manufacturers to encourage standardization.

The Salem District is remarkable in light of this standardization. There are many unusual examples of various types of metal trusses throughout the 12 counties of the District. Attempts to preserve significant trusses in the District have been successful, with the listing of a few trusses on the National Register of Historic Places and one relocation of a truss for alternative use. The diversity of trusses which were erected in the Salem District and the bridge companies which manufactured them can be examined in more detail in Tables 1 - 15, which are presented on pages 32 through 61, and in the inventory forms in the Appendix.

(Tables 1-15 follow)

2416

Table 1. Truss Types in the Salem Construction District

TRUSS TYPE / COUNTY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
BEDFORD	1-1915		*1-1909 1-1913 1-1915 3-ND	1-1929	1-1878	
BOTETOURT		1-1887 11-ND	1-ND	1-1930 3-1931 (mod)		2-ND (mod)
CARROLL			1-1919 1-1924 1-1931	1-1931 1-ND		
CRAIG		1-ND	1-1921 1-1922			1-ND
FLOYD			1-1911 1-1913 2-1917	2-ND		
FRANKLIN			1-1909 1-1920 1-1913 *4-ND 1-1915	1-1927 1-1929		
GILES	1-ND (full slope)		2-ND	1-1930 (mod)		1-1916
HENRY			1-1922 1-1931 1-ND	1-1928 2-1931 1-ND		2-1910
MONTGOMERY			2-1917 1-1921 1-ND	2-1924 1-1929 1-1930 (mod)		1-1917
PATRICK			1-1922	1-1927 1-1931 1-ND		
PULASKI			1-1909 1-1916	1-1922		
ROANOKE				2-1890 *1-ND 1-1929 4-ND		
TOTAL	2	13	36	32	1	7

ND - no date
* stylistic attribution

THROUGH (HIGH)

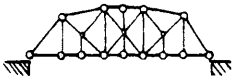
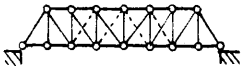
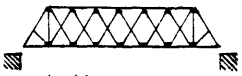
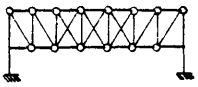
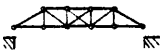
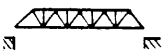
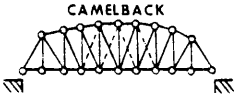
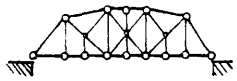
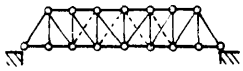
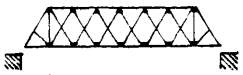
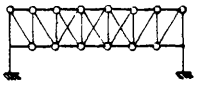
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
	1-1920 1-1928 1-ND	1-1929 (incl. chord)		1-ND	14
	6-1884 1-1915 1-1887 6-ND				33
					5
	?-1923	1-1924			7
					6
	1-1925 3-ND				14
4-ND	1-190[?] 1-1927 2-1924 4-ND	4-1930 (incl. chord)	1-ND		22
	1-1887				10
	1-1892 2-1918 1-ND	1-1923			14
	1-ND				5
	1-1914				4
	2-1916 1-ND				11
4	41	7	1	1	145

Table 2. Truss Dates and Connection Details in Salem Construction District

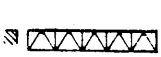
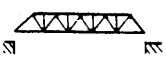
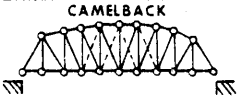
TRUSS TYPE	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
TRUSS DATES KNOWN: 1875-1910:19 1911-1932:64		1-1887	2-1909 *1-1909 1-1911 3-1913 2-1915 1-1916 4-1917 1-1919 1-1920 2-1921 3-1922 1-1924 2-1931	2-1890 1-1922 2-1924 2-1927 1-1928 4-1929 2-1930 (mod) 1-1930 3-1931 (mod) 4-1931	1-1878	2-1910 1-1916 1-1917
UNKNOWN: 62	2	12	12	10		3
CONNECTION DETAILS:						
PIN WITH LOOP-WELDED EYEBARS			*1-1909 1-1909 1-1913 3-ND			1-1916 1-ND
PIN WITH DIE-FORGED EYEBARS		1-ND				1-1917 2-1910 2-ND
PIN WITH COMBINATION EYEBARS						
RIGID: RIVETED GUSSET PLATES	1-1915 1-ND	1-1887 11-ND	1-1909 1-1911 2-1913 2-1915 1-1916 4-1917 1-1919 1-1920 2-1921 3-1922 1-1924 2-1931 3-ND	2-1890 1-1922 2-1924 2-1927 1-1928 4-1929 1-1930 2-1930 (mod) 4-1931 3-1931 (mod) 10-ND	1-1878	

ND - no date
* stylistic attribution

THROUGH (HIGH)					TOTAL
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	
	6-1884 2-1887 1-1892 1-190[?] 1-1914 1-1915 2-1916 2-1918 1-1920 2-1923 2-1924 1-1925 1-1927 1-1928	1-1923 1-1924 1-1929 (incl. chord) 4-1930 (incl. chord)			83
4	17		1	1	62

2-ND	1-190[?] 1-1915 2-1916 2-1924 1-1927 1-1928 5-ND			1-ND	24
2-ND	2-1887 1-1914 4-ND				15
	6-1884 1-1892 5-ND				12
	2-1918 1-1920 2-1923 1-1925 3-ND	1-1923 1-1924 1-1929 (incl. chord) 4-1930 (incl. chord)	1-ND		94

Table 3. Truss Types and Bridge Companies in the Salem Construction District

BRIDGE COMPANY \ TRUSS TYPE	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
AMERICAN BRIDGE & IRON COMPANY ROANOKE, VA.				2-1890		
ATLANTIC BRIDGE COMPANY CHARLOTTE, N.C.			1-1921	2-1924		
ATLANTIC BRIDGE COMPANY ROANOKE, VA.			1-1924	1-1922		
CAMDEN IRON WORKS SALEM, VA.	1-1915					
A.N. CAMPBELL & COMPANY LYNCHBURG, VA.						
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO			2-1917 1-1920 2-1922			1-1917
KING IRON BRIDGE & MFG. COMPANY CLEVELAND, OHIO					1-1878	
PHOENIX BRIDGE COMPANY PHOENIXVILLE, PA		1-1887 *1-ND				
RICHMOND & ALLEGHANY RR RICHMOND, VA.						
ROANOKE BRIDGE COMPANY ROANOKE, VA.			2-1909 1-1915 *1-1909 *6-ND 2-1913			
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.			2-1917 1-1921 1-1922	2-1927 3-1931 1-1928 *1-ND 4-1929 1-1930		
A&P ROBERTS CO. (AND PENCOYD IRON WORKS) PENCOYD, PA.		1-ND				
VIRGINIA BRIDGE COMPANY ROANOKE, VA.						
VA. BRIDGE & IRON COMPANY ROANOKE, VA.			1-1911 1-1916 1-1913 1-1931 1-1915			2-1910 1-1916
VIRGINIA DEPT. OF HIGHWAYS RICHMOND, VA.			1-1931	1-1930 1-1930 (mod) 3-1931 (mod) 1-1931		
VIRGINIA STATE HIGHWAY COMM. RICHMOND, VA.			1-1919			
UNKNOWN	1-ND (full-slope)	10-ND	6-ND	9-ND		2-ND (mod) 1-ND
TOTAL	2	13	36	32	1	7

THROUGH (HIGH)

ND - no date
* stylistic attribution

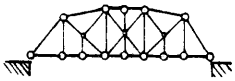
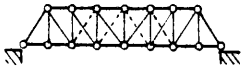
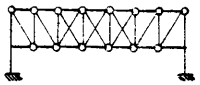
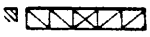
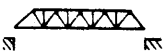
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					2
					3
					2
					1
		1-1929 (incl. chord) 4-1930 (incl. chord)			5
	2-1918 1-1920 2-1924				11
	1-1892				2
	1-1887				3
	6-1884				6
	1-190[?]				13
	2-1923				18
	1-ND				2
	1-1928				1
2-ND	1-1914 1-1927 1-1915 1-ND 2-1916				16
					7
	1-1905	1-1923 1-1924			4
1-ND	1-1887 15-ND		1-ND	1-ND	49
4	41	7	1	2	145

Table 4. Truss Types and Bridge Companies in Bedford County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
CAMDEN IRON WORKS SALEM, VA.	1-1915					
A.N. CAMPBELL & COMPANY LYNCHBURG, VA.						
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO						
KING IRON BRIDGE & MFG. COMPANY CLEVELAND, OHIO					1-1878	
ROANOKE BRIDGE COMPANY ROANOKE, VA.			*1-1909 1-1913 *1-ND			
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.				1-1929		
VIRGINIA BRIDGE COMPANY ROANOKE, VA.						
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.			1-1915			
UNKNOWN			2-ND			
TOTAL	1		6	1	1	

ND - no date
* stylistic attribution

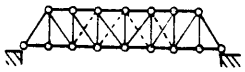
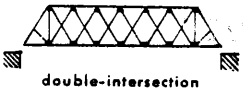
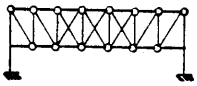
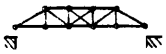
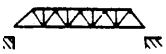
THROUGH (HIGH)					
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					1
		1-1929 (incl. chord)			1
	1-1920				1
					1
					3
					1
	1-1928				1
					1
	1-ND			1-ND	4
	3	1		1	14

Table 5. Truss Types and Bridge Companies in Botetourt County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
PHOENIX BRIDGE COMPANY PHOENIXVILLE, PA.		1-1887 *1-ND				
RICHMOND & ALLEGHANY RR RICHMOND, VA.						
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.				1-1930		
A&P ROBERTS CO. (AND PENCOYD IRON WORKS) PENCOYD, PA.		1-ND				
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.						
VIRGINIA DEPT OF HIGHWAYS RICHMOND, VA.				3-1931 (mod)		
UNKNOWN		9-ND	1-ND			2-ND (mod)
TOTAL		12	1	4		2

ND - no date
* stylistic attribution

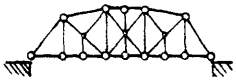
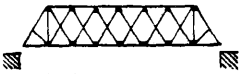
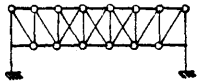
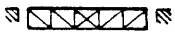
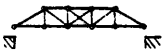
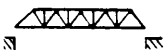
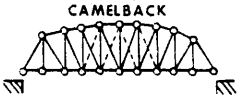
THROUGH (HIGH)					TOTAL
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	
	1-1887				3
	3-1884 3-1884				6
					1
	1-ND				2
	1-1915				1
					3
	5-ND				17
	14				33

Table 6. Truss Types and Bridge Companies in Carroll County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
ATLANTIC BRIDGE COMPANY ROANOKE, VA.			1-1924			
VIRGINIA DEPT. OF HIGHWAYS RICHMOND, VA.			1-1931	1-1931		
VIRGINIA STATE HIGHWAY COMM. RICHMOND, VA.			1-1919			
UNKNOWN				1-ND		
TOTAL			3	2		

ND - no date
* stylistic attribution

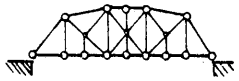
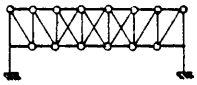
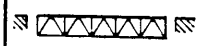
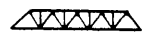
THROUGH (HIGH)					TOTAL
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	
					1
					2
					1
					1
					5

Table 7. Truss Types and Bridge Companies in Craig County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
ATLANTIC BRIDGE COMPANY CHARLOTTE, N.C.			1-1921			
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO			1-1922			
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.						
VIRGINIA STATE HIGHWAY COMM. RICHMOND, VA.						
UNKNOWN		1-ND				1-ND
TOTAL		1	2			1

ND - no date
* stylistic attribution

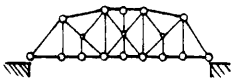
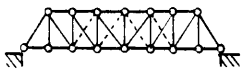
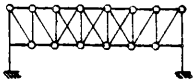
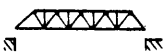
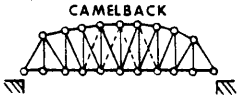
THROUGH (HIGH)					
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					1
					1
	2-1923				2
		1-1924			1
					2
	2	1			7

Table 8. Truss Types and Bridge Companies in Floyd County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
ROANOKE BRIDGE COMPANY ROANOKE, VA.			1-1913			
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.			2-1917			
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.			1-1911			
UNKNOWN				2-ND		
TOTAL			4	2		

ND - no date
* stylistic attribution

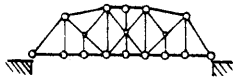
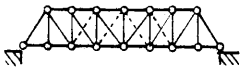
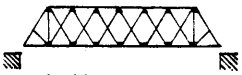
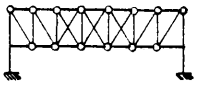
THROUGH (HIGH)					TOTAL
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	
					1
					2
					1
					2
					6

Table 9. Truss Types and Bridge Companies in Franklin County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT	TRIANGULAR	PRATT full-slope	TRIANGULAR	BOWSTRING	CAMELBACK Pratt
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO			1-1920			
ROANOKE BRIDGE COMPANY ROANOKE, VA.			1-1909 1-1915 *4-ND			
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.				1-1927 1-1929		
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.			1-1913			
VIRGINIA STATE HIGHWAY COMM. RICHMOND, VA.						
UNKNOWN						
TOTAL			8	2		

THROUGH (HIGH)

ND - no date
* stylistic attribution

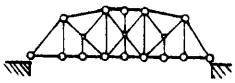
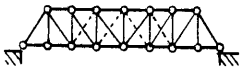
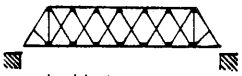
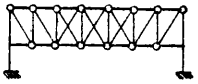
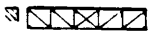
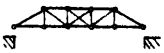
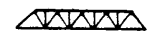
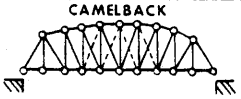
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					1
					6
					2
	1-ND				2
	1-1925				1
	2-ND				2
	4				14

Table 10. Truss Types and Bridge Companies in Giles County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
A.N. CAMPBELL, COMPANY, INC. LYNCHBURG, VA.						
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO						
ROANOKE BRIDGE COMPANY ROANOKE, VA.						
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.						1-1916
VIRGINIA DEPT. OF HIGHWAYS RICHMOND, VA.				1-1930 (mod)		
UNKNOWN	1-ND (full-slope)		2-NI			
TOTAL	1		2	1		1

ND - no date
* stylistic attribution

THROUGH (HIGH)

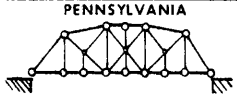
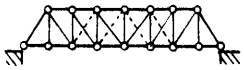
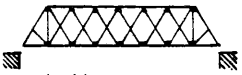
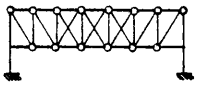
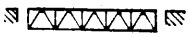
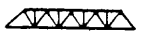
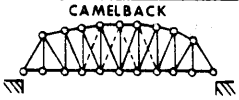
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
		4-1930 (incl. chord)			4
	2-1924				2
	1-190[?]				1
2-ND	1-1927				4
					1
2-ND	4-ND		1-ND		10
4	8	4	1		22

Table 11. Truss Types and Bridge Companies in Henry County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO			1-1922			
ROANOKE BRIDGE COMPANY ROANOKE, VA.			*1-ND			
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.				1-1928 2-1931		
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.			1-1931			2-1910
UNKNOWN				1-ND		
TOTAL			3	4		2

ND - no date
* stylistic attribution

THROUGH (HIGH)

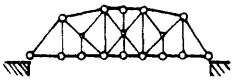
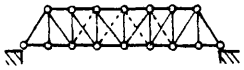
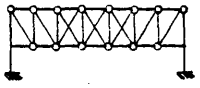
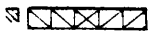
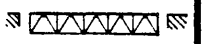
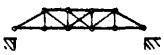
PENNSYLVANIA	PRATT	TRIANGULAR	TRIANGULAR	BEDSTEAD	TOTAL
 Petit	 single-intersection	 single-intersection	 double-intersection		
					1
					1
					3
					3
	1-1887				2
	1				10

Table 12. Truss Types and Bridge Companies in Montgomery County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
ATLANTIC BRIDGE COMPANY CHARLOTTE, N.C.				2-1924		
CHAMPION BRIDGE COMPANY WILMINGTON, OHIO			2-1917			1-1917
KING IRON BRIDGE & MFG. COMPANY CLEVELAND, OHIO						
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.			1-1921	1-1929		
VIRGINIA DEPT. OF HIGHWAYS RICHMOND, VA.				1-1930 (mod)		
VIRGINIA STATE HIGHWAY COMM. RICHMOND, VA.						
UNKNOWN			1-ND			
TOTAL			4	4		1

ND - no date
* stylistic attribution

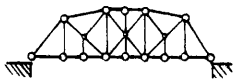
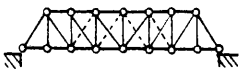
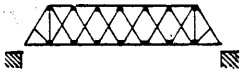
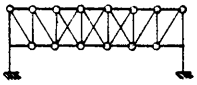
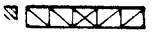
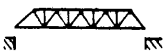
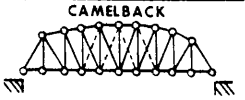
THROUGH (HIGH)					TOTAL
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	
					2
	2-1918				5
	1-1892				1
					2
					1
		1-1923			1
	1-ND				2
	4	1			14

Table 13. Truss Types and Bridge Companies in Patrick County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.			1-1922	1-1927 1-1931		
UNKNOWN				1-ND		
TOTAL			1	3		

ND - no date
* stylistic attribution

THROUGH (HIGH)

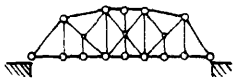
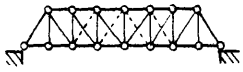
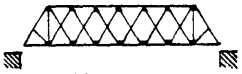
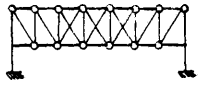
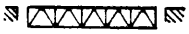
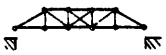
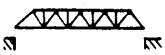
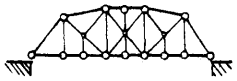
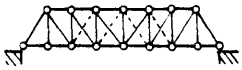
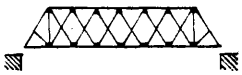
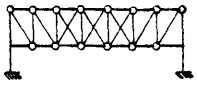
PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					3
	1-ND				2
	1				5

Table 14. Truss Types and Bridge Companies in Pulaski County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
ATLANTIC BRIDGE COMPANY ROANOKE, VA.				1-1922		
ROANOKE BRIDGE COMPANY ROANOKE, VA.			1-1909			
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.			1-1916			
TOTAL			2	1		

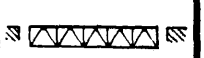
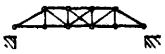
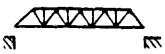
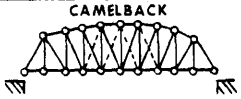
ND - no date
* stylistic attribution

THROUGH (HIGH)

PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					1
					1
	1-1914				2
	1				4

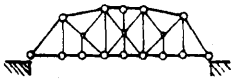
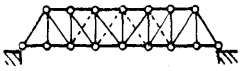
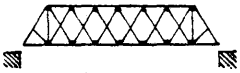
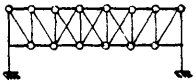
2444

Table 15. Truss Types and Bridge Companies in Roanoke County

TRUSS TYPE / BRIDGE COMPANY	DECK		LOW (PONY)			
	PRATT 	TRIANGULAR 	PRATT  full-slope	TRIANGULAR 	BOWSTRING 	CAMELBACK  Pratt
AMERICAN BRIDGE & IRON COMPANY ROANOKE, VA.				2-1890		
ROANOKE IRON & BRIDGE WORKS ROANOKE, VA.				1-1929 *1-ND		
VIRGINIA BRIDGE & IRON COMPANY ROANOKE, VA.						
UNKNOWN				4-ND		
TOTAL				8		

ND - no date
* stylistic attribution

THROUGH (HIGH)

PENNSYLVANIA  Petit	PRATT  single-intersection	TRIANGULAR  single-intersection	TRIANGULAR  double-intersection	BEDSTEAD 	TOTAL
					2
					2
	2-1916				2
	1-ND				5
	3				11

REFERENCES

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5. Article of Agreement, Richmond and Alleghany Railroad and County of Botetourt, May 28, 1883.

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7. Ketchum, Milo S., The Design of Highway Bridges, New York, McGraw-Hill Book Company, 1908, pp. 399-401.

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9. Bedford County Court Order Book 40, pp. 179-180, December 11, 1877.

10. Ketchum, op. cit. pp. 197-198.

11. Waddell, J. A. L., The Designing of Ordinary Iron Highway Bridges, New York, John Wiley & Sons, Inc., 1891, 5th ed., p. iv.

12. _____, Bridge Engineering, p. 25.

13. Ibid., p. 24.

14. Ketchum, op. cit. p. 7.

15. Ibid.

16. Waddell, Bridge Engineering, p.471.

17. Ibid., p. 24.

18. Phoenixville Bridge Works, Clark, Reeves & Co., 2nd Illustrated Album of Designs, 1873, Philadelphia, J. B. Lippincott & Co., pp. 12-13. (Courtesy of Robert Vogel, Smithsonian Institution.)

19. Cooper, op. cit., p. 32.

20. Hensley, Barbara E., "Craig Valley Railroad", Virginia Highway and Transportation Research Council, forthcoming.

21. Waddell, J. A. L., de Pontibus, 1898, p. 134.

22. _____, Bridge Engineering, p. 25.

23. Ketchum, op. cit., pp. 198-210.

24. Jacobs, E. B., History of Roanoke City and History of the Norfolk & Western Railway Company, Roanoke, Stone Printing, 1912, p. 112.

25. Ibid., p. 124.

26. Ibid., p. 129.

27. Ibid., p. 49.

28. Federal Works Agency, Roanoke City School Board, op. cit, p. 205

29. Phoenixville Bridge Works, op. cit.

30. Phoenixville Bridge Works, op. cit.

APPENDIX

R-358

2451 A-1

Photo Numbers:

12455-10: 13-18

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. 02 .
County: Bedford ; No. 09 .
~~City~~/Town: West of Forest .
~~Xxxxx~~/Road: State route 666 .
~~River~~/Stream/~~Railroad~~ (crossing): Elk Creek .
UTM/KGS Coordinates: .

Historical Information

Formal designation: 0608 (Structure Tabulation No.) .
Local designation: 6087 (District Structure No.) .
Designer: Virginia State Highway Commission, Richmond, Virginia .
Builder: Camden Iron Works, Roanoke, Virginia .
Date: 1915 ; basis for: bridge/date plate .
Original owner: Va. State Highway Commission ; use: vehicular bridge .
Present owner: Va Dept. of Highways & Transp. ; use: vehicular bridge .

Historical or Technological Significance

_____ Unique/Unusual in its time: .

X Rare survivor though of standard design: a standard Pratt configured truss but this is a deck truss bridge .

_____ Typical example of its time and a common survivor: .

X Other Remarks/Explanation: this stretch of road was formerly a railroad bed for a line that went from Lynchburg to Tennessee. This metal truss was apparently built to replace the previous structure when the Highway Commission took over the road.

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

Bridge. Safety. Inspection File, Salem District Bridge Office.

Recorder: Dan Deibler/Paula Spero .
Date: 18 June 1975/ 9 July 1979 .
Affiliation: Research Council .

Design Information

Compass orientation of axis: NE/SW .

No. of spans: one (1); length; overall: 110' .
Span types:
(1) deck truss ; length: 106.8' .
(2) ; length: .
(3) ; length: .
(4) ; length: .
(5) ; length: .
(6) ; length: .

No. of lanes: one (1) ; width: 13.35' c to c.

Architectural or decorative features:

Simple 2-pipe side railing.

The stone masonry abutments are handsomely crafted and made up of rather massive blocks. They date from the previous structure on the site.

Structural Information

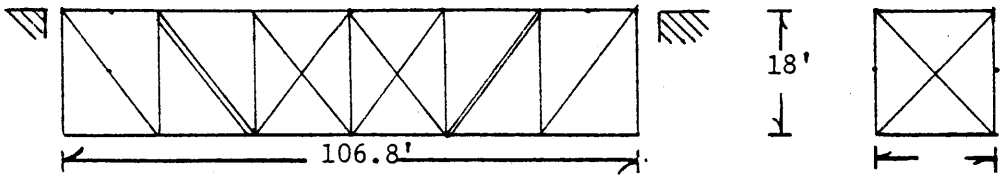
Substructure:
Material: concrete; stone .
Foundations: .
Piers: .
Abutments: coursed, ashlar stone masonry .
Wings: coursed, ashlar stone masonry .
Seats: concrete .

Superstructure:
Material: steel sources .
Characteristics, details and members:
Connections: pin.
X rigid.
Top Chords 2 up-right channels connected w/lacing bars top & bottom .
End Posts: vertical w/2-up-right channels connected w/lacing bars top & bottom .
Bottom chords: paired angles connected w/stay plates .
Posts: 2 vertical channels connected w/lacing bars .
Diagonals: paired angles connected w/stay plates .
Counters: single crossed angles .

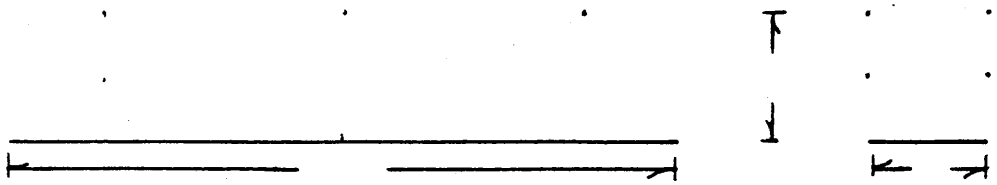
Truss Configuration

Main span type: Pratt

Deck



Secondary span type: Through/Pony/Deck, Skew



R-358

'245ø A-3

Photo Numbers:

12455-14: ØA-1ØA

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Bedford ; No. Ø9 .
~~City~~/Town: Joppa Mill .
~~Street~~/Road: State route 747 .
~~River~~/Stream/~~Railroad~~ (crossing): Goose Creek .
UTM/KGS Coordinates: .

Historical Information

Formal designation: 1529 (Structure Tabulation No.) .
Local designation: 6144 (District Structure No.) .
Designer: .
Builder: .
Date: ; basis for: no date/bridge plate .
Original owner: Bedford County ; use: vehicular bridge .
Present owner: Va Dept of Highways & Transp. ; use: vehicular bridge .

Historical or Technological Significance

x Unique/Unusual in its time: this is the only observed through/high bedstead truss .

____ Rare survivor though of standard design: .

____ Typical example of its time and a common survivor: .

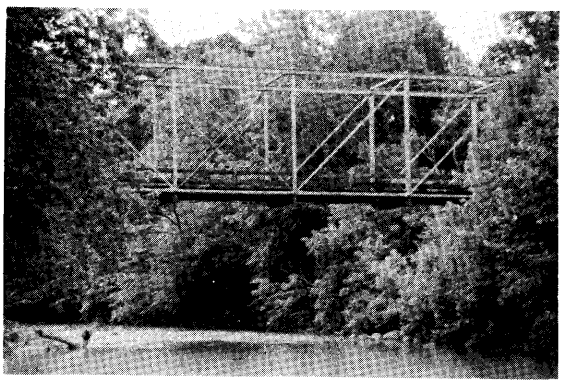
x Other Remarks/Explanation: bolted splice plates on top chords indicate that truss was moved. Records show that the bridge was moved in 1948 by state forces from its site on route 297 (460) over Big Otter River. The bridge was also widened by 2 feet.

Nature/Degree of any destructive threats: scheduled for replacement in 1976.

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILE, Salem District Bridge Office.

PLANS: c11-14, January 1948



Recorder: Dan Deibler/Paula Spero .
Date: 20 June 1975/ 9 July 1979 .
Affiliation: Research Council .

2454

Design Information

Compass orientation of axis: NE/SW.

No. of spans: one (1); length; overall: 140'.
Span types:
(1) thru truss; length: 119'.
(2) steel beam; length: 21'.
(3) ; length: .
(4) ; length: .
(5) ; length: .
(6) ; length: .

No. of lanes: one (1); width: 15' c to c.

Architectural or decorative features:

Simple wood side railings.

Bottom chords have alternating sections of 2-angles connected w/stay plates (panels #1,3,5,7) and paired rectilinea eye bars (panels #2 & 6); center panel (#4) has quadruple eye bars.

Diagonals in end panels have 2 angles connected w/stay plates.
Lateral struts are 2 angles, back-to-ba riveted to a continuous plate.

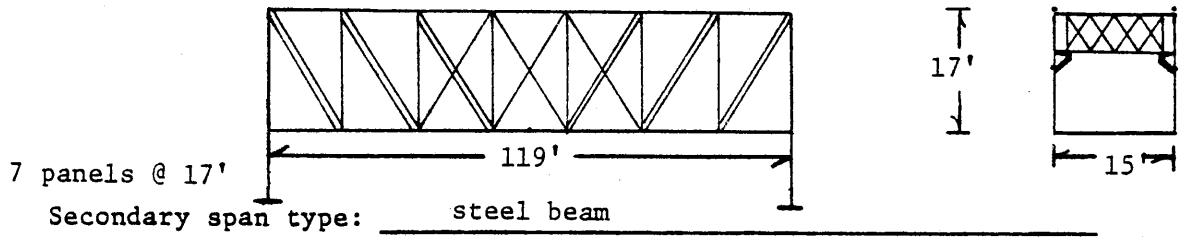
Structural Information

Substructure:
Material: concrete; steel.
Foundations: .
Piers: steel.
Abutments: concrete.
Wings: concrete.
Seats: concrete.

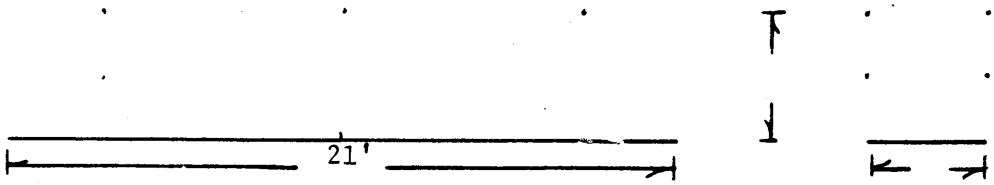
Superstructure:
Material: steel **sources** Jones & Laughlin.
Characteristics, details and members:
Connections: x **pin.**
_____ **rigid.**
Top Chords 2 up-right channels connected w/lacing bars & stay plates.
End Posts: 2 vertical channels connected w/lacing bars & stay plates.
Bottom chords: see above.
Posts: 2 vertical channels connected w/opposing lacing bars.
Diagonals: double rectilinear eye bars, loop welded.
Counters: single cylindrical eye bars, loop welded.

Truss Configuration

Main span type: Pratt, bedstead **Through**



Secondary span type: steel beam **Deck**



R-358

2455 A-5

Photo Numbers:

12455-38: 15A-19A

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
~~City~~/Town: Lick Run .
~~Street~~/Road: state route 220 .
River/~~Stream/Railroad~~ (crossing): James River .
UTM/KGS Coordinates: .

Historical Information

Formal designation: 1171 (Structure Tabulation No.) .
Local designation: 1Ø21 (District Structure No.) .
Designer: Virginia Department of Highways, Richmond, Virginia .
Builder: Blount & Hayman .
Date: 1931 ; basis for: bridge/date plate .
Original owner: Va. State Highway Commission ; use: vehicular bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: vehicular bridge .

Historical or Technological Significance

x Unique/Unusual in its time: the trusses are not unusually configured but the bridge is built on a 3.0% gradient.

____ Rare survivor though of standard design: .

____ Typical example of its time and a common survivor: .

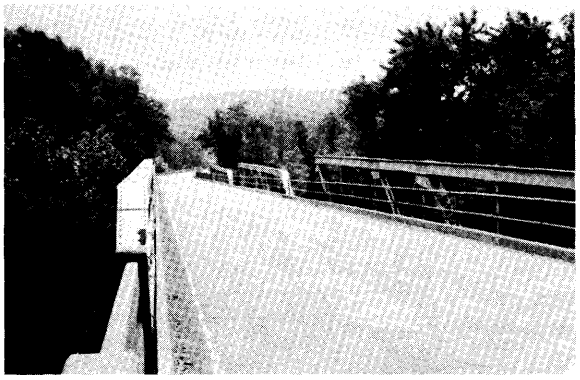
x Other Remarks/Explanation: 3.0% gradient resulted in the trusses being built in a cascade or stepped manner

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILE,
Salem District Bridge Office

PLANS: XL 11-16, 12 January 1931
sc-24-105, sc-24-50



Recorder: Dan Deibler .
Date: 22 August 1975 .
Affiliation: Research Council .

2450

Design Information

Compass orientation of axis: N/S.

No. of spans: nine (9); length; overall: 632'.

Span types:

(1) concrete beam; length: 52' 6".
(2) concrete beam; length: 52' 4".
(3) low truss; length: 105'.
(4) low truss; length: 105'.
(5) low truss; length: 106'.
(6)- (9) concrete beam; length: 52'6".

No. of lanes: two (2); width: 25'6" c to c.

Architectural or decorative features:

Simple 2-pipe side railings.

Structural Information

Substructure:

Material: concrete.
Foundations:
Piers: concrete.
Abutments: concrete.
Wings: concrete.
Seats: concrete.

Superstructure:

Material: steel. sources .

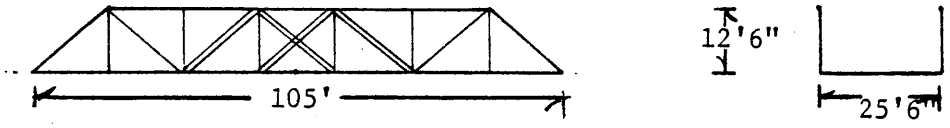
Characteristics, details and members:

Connections: pin.
x rigid.
Top Chords 2 up-right channels connected w/cover plates & lacing bars.
End Posts: 2 up-right channels connected w/cover plates & lacing bars.
Bottom chords: 2 up-right channels connected w/stay plates.
Posts: paired back-to-back angles connected w/continuous plate.
Diagonals: paired back-to-back angles connected w/stay plates.
Counters: 2 up-right channels connected w/lacing bars & 2 angles connected w/stay plates.

Truss Configuration

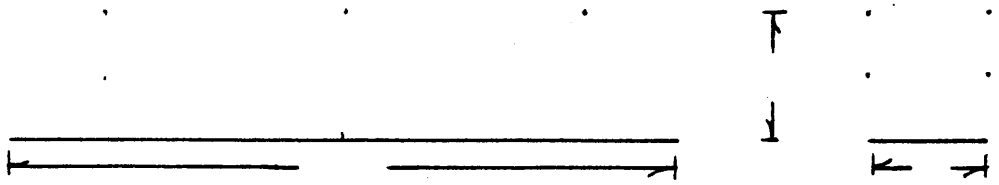
Main span type: Triangular (modified)

Pony



Secondary span type: Concrete beam

Deck



R-358

2457 A-7

Photo Numbers:

12455-39: 5-7

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2.
County: Botetourt ; No. 11.
~~City~~/Town: west of Arcadia.
~~Street~~/Road: route 614.
River/~~Stream/Railroad~~ (crossing): James River.
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: 6161 (District Structure No.).
Designer: .
Builder: .
Date: ; basis for: .
Original owner: ; use: .
Present owner: ; use: .
Reconstr: 11/53

Historical or Technological Significance

___ Unique/Unusual in its time: .

x Rare survivor though of standard design: one of a few multiple span deck truss bridges in the state.

___ Typical example of its time and a common survivor: .

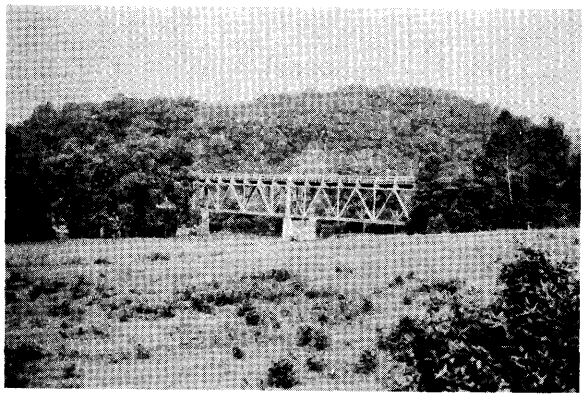
x Other Remarks/Explanation: this truss system was erected at this site in 1953 prior to which it was located at Radford crossing the New River

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILES,
Salem District Bridge Office.

PLANS: cxvi-6, 16 December 1953.



Recorder: Dan Deibler.
Date: 22 August 1975.
Affiliation: Research Council.

2458

Design Information

Compass orientation of axis: NE/SW .

No. of spans: eight (8) length; overall: 692' .

Span types:

(1) steel beam ; length: 38' .
(2) steel beam ; length: 43' .
(3 - 7) 5 triangular ; length: 3 @ 114' 2 @ 113'
trusses ; length: .
(8) steel beam ; length: 43' .
; length: .

No. of lanes: two (2); width: _____ c to c.

Architectural or decorative features:

Simple channel & angle side railings.

Structural Information

Substructure:

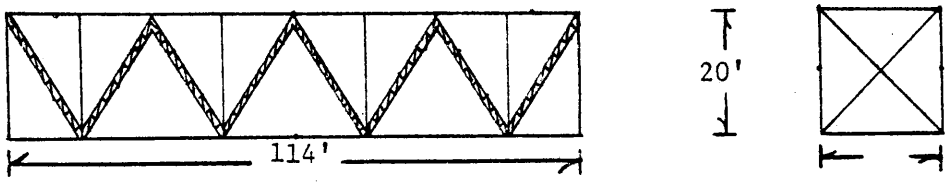
Material: concrete; steel .
Foundations: .
Piers: concrete; steel bents .
Abutments: concrete .
Wings: concrete .
Seats: concrete .

Superstructure:

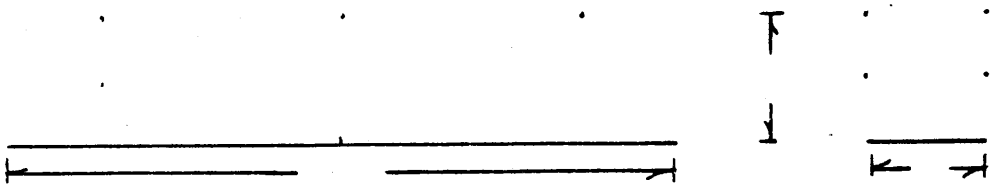
Material: steel sources .
Characteristics, details and members:
Connections: _____ pin.
x rigid.
Top Chords 2 built-up channels connected w/cover plates & lacing bars .
End Posts: 2 built-up channels connected w/coverplates & lacing bars .
Bottom chords: double rectilinear eye bars, die forged; end panels have angles & lacing.
Posts: built-up channels w/lacing bars .
Diagonals: double rectilinear eye bars; die forged .
Counters: 2 up-right channels connected w/lacing bars .

Truss Configuration

Main span type: Triangular w/verticals



Secondary span type: steel beam



R-358

2459

Photo Numbers:

12455-39: 8-18

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
~~City~~/Town: Springwood .
~~Xxxxx~~/Road: state route 630 .
River/~~Xxxxxx/Railroad~~ (crossing): James River .
UTM/KGS Coordinates: .

Historical Information

Formal designation: Ø786 (Structure Tabulation No.) .
Local designation: 6Ø77 (District Structure No.) .
Designer: Richmond & Allegheny Railroad Company .
Builder: Richmond & Allegheny Railroad Company .
Date: 1883-1885 ; basis for: "Articles of Agreement" .
Original owner: Botetourt County ; use: vehicular bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: vehicular bridge .

Historical or Technological Significance

x Unique/Unusual in its time: one of three timber truss bridges on the James River (Cartersville, Springwood & Eagle Rock.) .

___ Rare survivor though of standard design: .

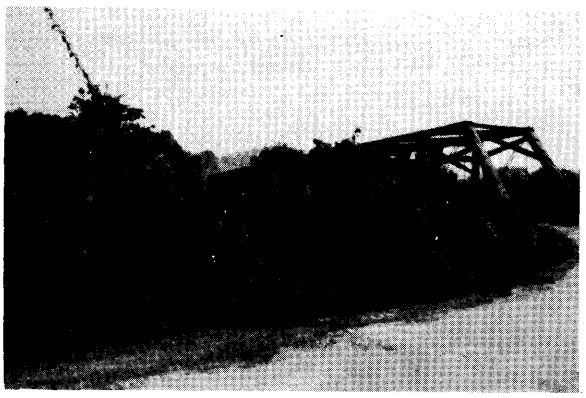
___ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: Bridges were to be built between May 1883 and October 1885 by the railroad and then turned over to the county.
National Register of Historic Places - April 15, 1978
Virginia Landmarks Register - Nov. 15, 1977

Nature/Degree of any destructive threats: to be replaced in 1976-77 (by-passed rather than removed) .

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILE,
Salem District Bridge Office.
"Articles of Agreement" 2 (?) May 1883



Recorder: Dan Deibler .
Date: 22 August 1975 .
Affiliation: Research Council, .

Design Information

Compass orientation of axis: NE/SW.

No. of spans: three (3); length; overall: 391'8".

Span types:
(1) thru truss; length: 95'.
(2) thru truss; length: 140'.
(3) thru truss; length: 140'6".
(4) _____; length: _____.
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: one (1); width: _____ c to c.

Architectural or decorative features:

Simple wood side railing

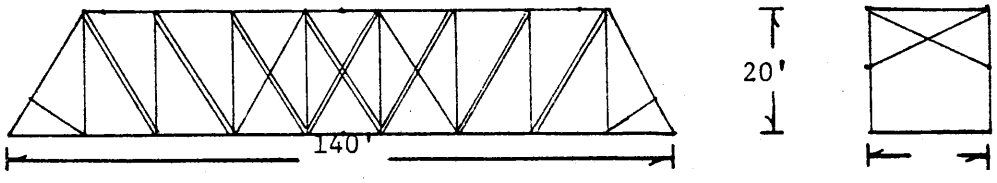
Structural Information

Substructure:
Material: stone (believed to be limestone).
Foundations: _____.
Piers: random tooled, coursed ashlar limestone masonry.
Abutments: random tooled, coursed ashlar limestone masonry.
Wings: limestone.
Seats: limestone.

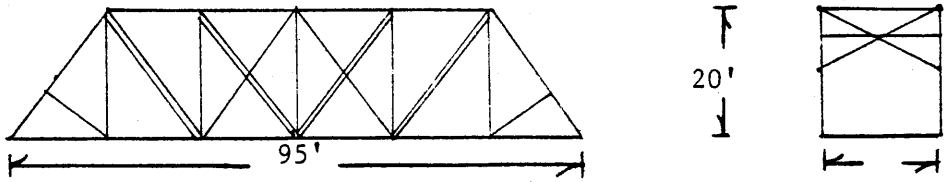
Superstructure:
Material: wood; wrought iron **sources** _____.
Characteristics, details and members:
Connections: x pin.
_____ rigid.
Top Chords double wood timbers bolted together.
End Posts: double wood timbers bolted together.
Bottom chords: double rectilinear or cylindrical eyebars, die forged or loop welded.
Posts: double wood timbers bolted together.
Diagonals: double cylindrical eyebars, loop welded.
Counters: single cylindrical eyebars, loop welded.

Truss Configuration

Main span type: Pratt Through



Secondary span type: Pratt Through



intermediate lateral struts

R-358

2461 A-11

Photo Numbers:

12455-36: 14A-2ØA
12455-45: 2-6

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
~~City~~/Town: Whitten .
~~Secondary~~/Road: state route 685 .
~~River~~/Stream/~~Railroad~~ (crossing): Craig Creek .
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: 6386 (District Structure No.) .
Designer: The Phoenix Bridge Company, Phoenixville, Pennsylvania .
Builder: The Phoenix Bridge Company, Phoenixville, Pennsylvania .
Date: 1887 ; basis for: bridge/date plate .
Original owner: ; use: railroad bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: vehicular bridge .

Historical or Technological Significance

x Unique/Unusual in its time: unusually elegant and decorative portal elements grace this truss. The truss also has the patented Phoenix column .

____ Rare survivor though of standard design: .

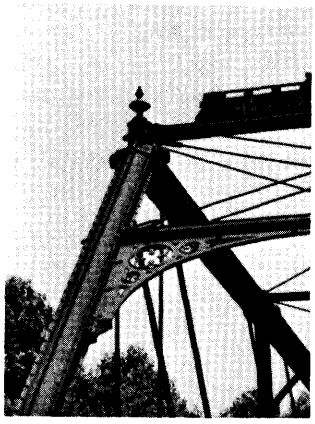
____ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: Phoenix column composed of segments of rolled wrought iron. These elements are used for end posts, top chords & intermedial posts. It is a heavily structured truss, located on the Craig Valley subdivision of the C & O Railroad.
National Register of Historic Places - April 15, 1978
Virginia Landmarks Register - Feb. 18, 1975 .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILE,
Salem District Bridge Office.



Recorder: Dan Deibler/Paula Spero .
Date: 22 August 1975/July 25, 1979 .
Affiliation: Research Council .

Design Information

Compass orientation of axis: NE/SW .

No. of spans: two (2) ; length; overall: 266'8" .
Span types:
(1) deck truss ; length: 75' .
(2) thru truss ; length: 150' .
(3) _____ ; length: _____ .
(4) _____ ; length: _____ .
(5) _____ ; length: _____ .
(6) _____ ; length: _____ .

No. of lanes: one (1); width: 16' c to c.

Architectural or decorative features:

Simple channel side railings
Lateral struts are Phoenix columns w/sway braces.

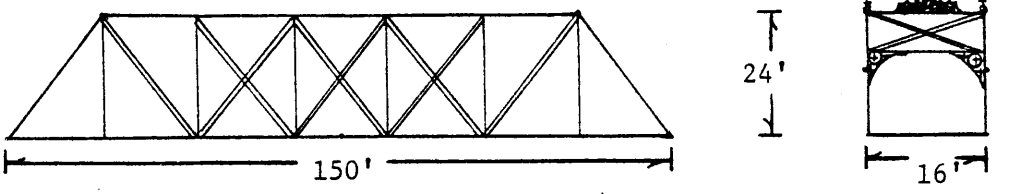
Structural Information

Substructure:
Material: stone, concrete .
Foundations: _____ .
Piers: coursed, rusticated, ashlar masonry w/a suggestion of quoins .
Abutments: coursed, ashlar masonry .
Wings: concrete .
Seats: concrete .

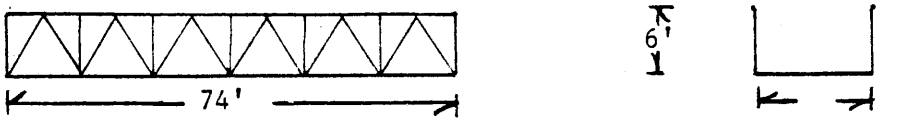
Superstructure:
Material: wrought iron . **sources** Phoenix Iron Company .
Characteristics, details and members:
Connections: x **pin.**
_____ **rigid.**
Top Chords Phoenix Columns .
End Posts: Phoenix Columns .
Bottom chords: double & quadruple rectilinear eyebars, die forged .
Posts: Phoenix columns .
Diagonals: double rectilinear eyebars; die forged .
Counters: double rectilinear tie rods, die forged .

Truss Configuration

Main span type: Pratt **Through**



Secondary span type: Warren/triangular **Deck**



R-358

2483

Photo Numbers:

129254: 4-6

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
City/Town: .
Street/Road: C & O RR, Craig Valley Subdivision .
~~River~~/Stream/~~Railroad~~ (crossing): Craigs Creek .
UTM/KGS Coordinates: .

Historical Information

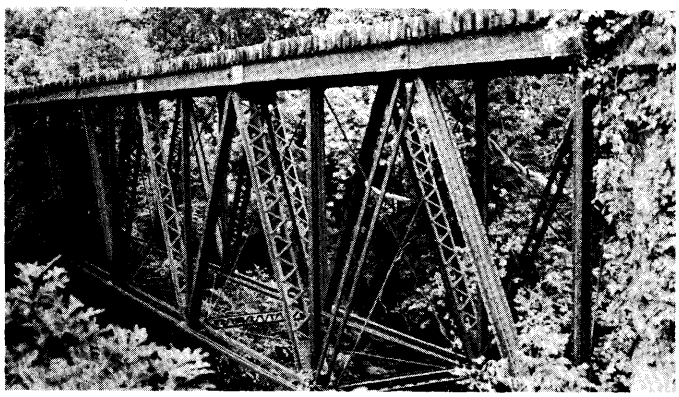
Formal designation: .
Local designation: .
Designer: .
Builder: .
Date: ; basis for: .
Original owner: C & O RR ; use: railroad bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: -------- .

Historical or Technological Significance

x Unique/Unusual in its time: Phoenix columns used for some compression members. long span, deep Warren, with verticals, deck truss .
___ Rare survivor though of standard design: which is pin-connected .
___ Typical example of its time and a common survivor: .
___ Other Remarks/Explanation: .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:



Recorder: Paula A. C. Spero .
Date: July 25, 1979 .
Affiliation: VHTRC .

Design Information

Compass orientation of axis: _____.

Architectural or decorative features:

No. of spans: one (1) ; length; overall: 224'4" .
Span types:
(1) deck truss ; length: 224'4" .
(2) _____; length: _____.
(3) _____; length: _____.
(4) _____; length: _____.
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: _____; width: _____ c to c.

Structural Information

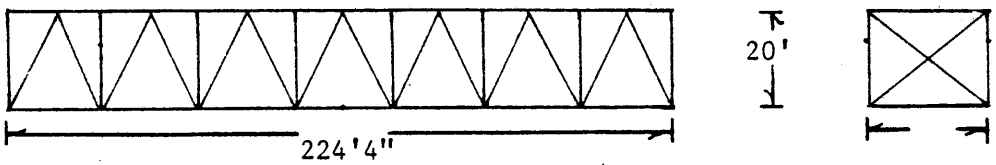
Substructure:
Material: concrete .
Foundations: concrete .
Piers: _____.
Abutments: concrete .
Wings: concrete .
Seats: _____.

Superstructure:
Material: _____ sources _____.
Characteristics, details and members:
Connections: x pin.
_____ rigid.
Top Chords 2 angles with upright plate and cover plate .
End Posts: Phoenix columns .
Bottom chords: die forged eyebars (rectilinear) .
Posts: Phoenix columns .
Diagonals: some Phoenix columns, some channels with lacing, some rolled sections .
Counters: die forged eyebars (rectilinear) .

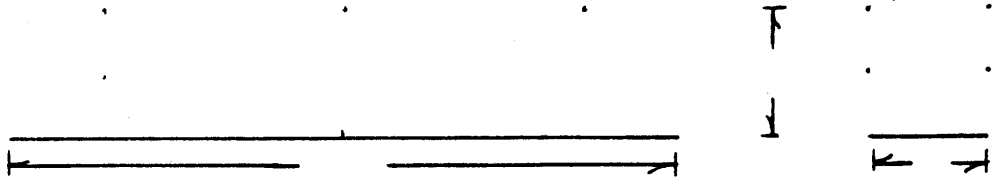
Truss Configuration

Main span type: Warren with verticals

Deck



Secondary span type: _____ Through/Pony/Deck, Skew



2465 A-15

R-358

Photo Numbers:

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
City/Town: .
Street/Road: C & O RR, Craig Valley subdivision .
~~River~~/Stream/~~Railroad~~ (crossing): Craig's Creek .
UTM/KGS Coordinates: .

12925A: 14-17

Historical Information

Formal designation: .
Local designation: .
Designer: .
Builder: .
Date: ; basis for: .
Original owner: C & O RR ; use: railroad bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: ---------- .

Historical or Technological Significance

_____ Unique/Unusual in its time: .

_____ Rare survivor though of standard design: .

_x_ Typical example of its time and a common survivor: 2 span Pratt through truss .

_____ Other Remarks/Explanation: .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

Recorder: Paula A. C. Spero .
Date: July 25, 1979 .
Affiliation: VHTRC .

2466

Design Information

Compass orientation of axis: _____.

Architectural or decorative features:

No. of spans: two (2); length; overall: _____.

Span types:

(1) through truss ; length: 132'.
(2) through truss ; length: 132'.
(3) _____; length: _____.
(4) _____; length: _____.
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: _____; width: _____ c to c.

Structural Information

Substructure:

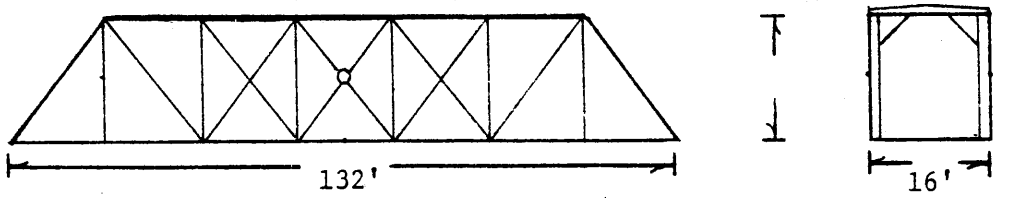
Material: concrete.
Foundations: concrete.
Piers: concrete.
Abutments: concrete.
Wings: _____.
Seats: _____.

Superstructure:

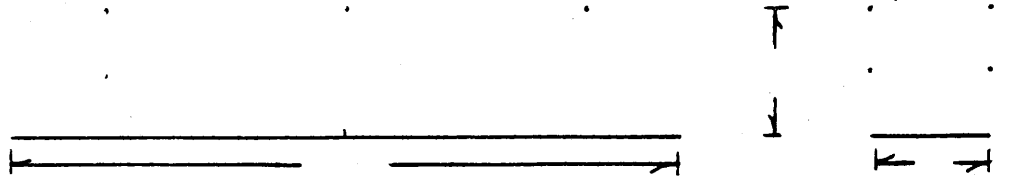
Material: _____ sources _____.
Characteristics, details and members:
Connections: x pin.
_____ rigid.
Top Chords 2 channels with lacing and cover plate.
End Posts: 2 channels with lacing and cover plate.
Bottom chords: rectilinear die forged eyebars.
Posts: 4 angles with stay plates.
Diagonals: 2 flat rectilinear die forged eyebars.
Counters: 1 square loop welded eyebar.

Truss Configuration

Main span type: Pratt Through



Secondary span type: _____ Through/Pony/Deck, Skew



R-358

A-17

2467

Photo Numbers:

12925A: 7-13

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
City/Town: .
Street/Road: C & O RR, Craig Valley Subdivision .
~~River~~/Stream/~~Railroad~~ (crossing): Craig's Creek .
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: .
Designer: .
Builder: A & P Roberts Co.; Pencoyd Iron Works, Pencoyd, Pa. .
Date: 1901 ; basis for: bridge plate .
Original owner: C & O RR ; use: railroad bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: ----- .

Historical or Technological Significance

____ Unique/Unusual in its time: .

____ Rare survivor though of standard design: .

__x__ Typical example of its time and a common survivor: Pratt through truss and Warren deck truss .

____ Other Remarks/Explanation: .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

Recorder: Paula A. C. Spero .
Date: Jule 25, 1979 .
Affiliation: VHTRC .

Design Information

Compass orientation of axis: _____.

Architectural or decorative features:

No. of spans: two (2); length; overall: 230'.

Span types:

(1) deck truss; length: 75'8".
(2) through truss; length: 152'.
(3) _____; length: _____.
(4) _____; length: _____.
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: _____; width: _____ c to c.

Structural Information

Substructure:

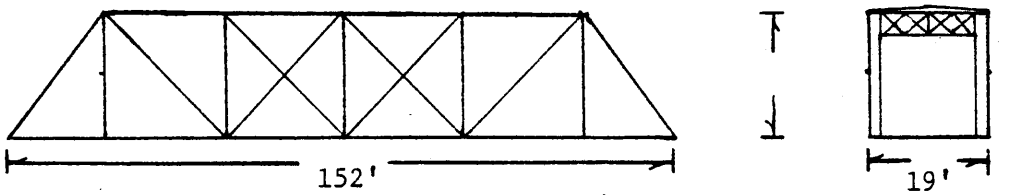
Material: concrete & stone masonry.
Foundations: _____.
Piers: rusticated ashlar.
Abutments: concrete.
Wings: _____.
Seats: _____.

Superstructure:

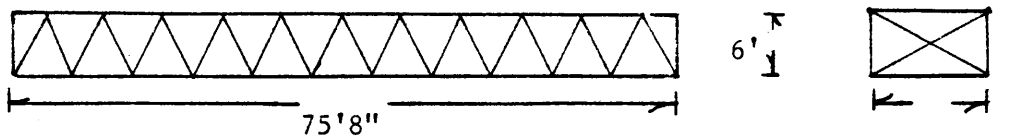
Material: _____ sources Pencoyd Iron Works, Pencoyd, Pa.
Characteristics, details and members:
Connections: x pin.
_____ rigid.
Top Chords 2 channels with laticing.
End Posts: 2 channels with laticing & cover plates.
Bottom chords: die forged eyebars.
Posts: 2 channels with lacing.
Diagonals: 2 rectilinear die forged eyebars.
Counters: adjustable rectilinear loop welded eyebar.

Truss Configuration

Main span type: Pratt Through



Secondary span type: Warren Deck



R-358

2469 A-19

Photo Numbers:

12925B: 21-28

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Botetourt ; No. 11 .
~~City~~/Town: Bessemer .
Street/Road: C & O RR, Craig Valley Subdivision .
River/~~Stream/Railroad~~ (crossing): James River .
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: .
Designer: .
Builder: .
Date: ; basis for: .
Original owner: C & O RR ; use: railroad bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: -------- .

Historical or Technological Significance

_____ Unique/Unusual in its time: .

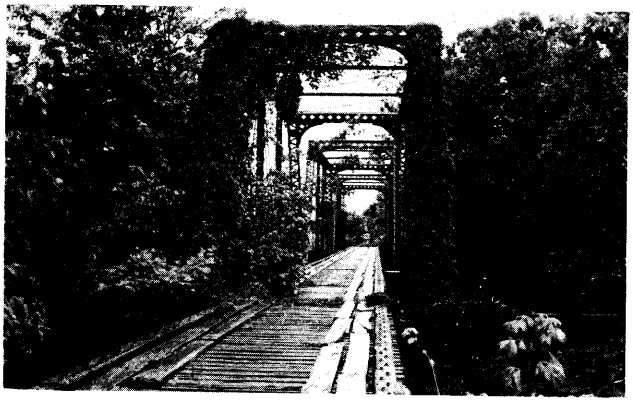
x Rare survivor though of standard design: only multi-mode bridge surveyed in Virginia .

_____ Typical example of its time and a common survivor: .

_____ Other Remarks/Explanation: .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:



Recorder: Paula A. C. Spero'
Date: July 25, 1979
Affiliation: VHTRC

Design Information

Compass orientation of axis: _____.

Architectural or decorative features:

Stamped cloverleaf pattern on portal

No. of spans: four (4); length; overall: 404'.

Span types:

(1) plate girder; length: 50'.
(2) through truss; length: 100'.
(3) through truss; length: 100'.
(4) through truss; length: 100'.
(5) plate girder; length: 50'.
(6) _____; length: _____.

No. of lanes: _____; width: _____ c to c.

Structural Information

Substructure:

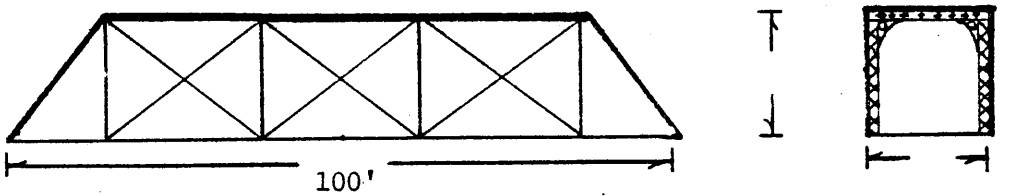
Material: concrete & stone masonry.
Foundations: _____.
Piers: rusticated ashlar.
Abutments: concrete.
Wings: _____.
Seats: _____.

Superstructure:

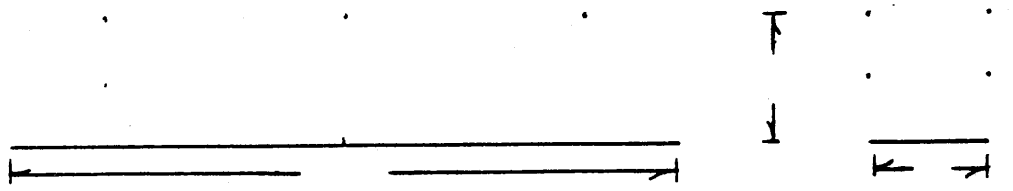
Material: _____ sources _____.
Characteristics, details and members:
Connections: x pin.
_____ rigid.
Top Chords 2 channels with lacing.
End Posts: 2 channels with lacing.
Bottom chords: die forged eyebars.
Posts: 2 channels with lacing.
Diagonals: rectilinear eyebars.
Counters: adjustable cylindrical eyebars.

Truss Configuration

Main span type: Pratt Through



Secondary span type: Plate Girder Deck



2471 A-21

R-358

Photo Numbers:

12925A: 1-3

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Craig Co. ; No. 22 .
City/Town: .
Street/Road: C & O RR, Craig Valley Subdivision .
~~River~~/Stream/~~Railroad~~ (crossing): Barbours Creek .
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: .
Designer: .
Builder: .
Date: ; basis for: .
Original owner: C & O RR ; use: railroad bridge .
Present owner: Va. Dept. of Hwys. & Transp. ; use: ------- .

Historical or Technological Significance

___ Unique/Unusual in its time: .

x Rare survivor though of standard design: Warren deck truss .

___ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: only truss framework remains, deck is gone. All members are built up angles and plates which gives truss the appearance of being built later than the other trusses on this railroad spur.

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

Recorder: Paula A. C. Spero .
Date: July 25, 1979 .
Affiliation: VHTRC .

Design Information

Compass orientation of axis: _____.

Architectural or decorative features:

No. of spans: one (1); length; overall: 74'6".
Span types:
(1) deck truss; length: 74'6".
(2) _____; length: _____.
(3) _____; length: _____.
(4) _____; length: _____.
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: one (1); width: _____ c to c.

Structural Information

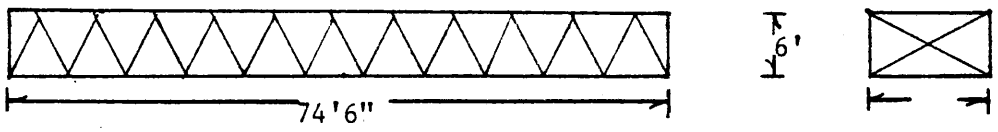
Substructure:
Material: concrete.
Foundations: _____.
Piers: _____.
Abutments: concrete.
Wings: _____.
Seats: _____.

Superstructure:
Material: steel sources _____.
Characteristics, details and members:
Connections: _____ pin.
x rigid.
Top Chords 2 angles with upright plate and cover plate.
End Posts: 2 angles back to back.
Bottom chords: 2 angles with upright plate.
Posts: _____.
Diagonals: 2 angles back to back.
Counters: 2 plates back to back.

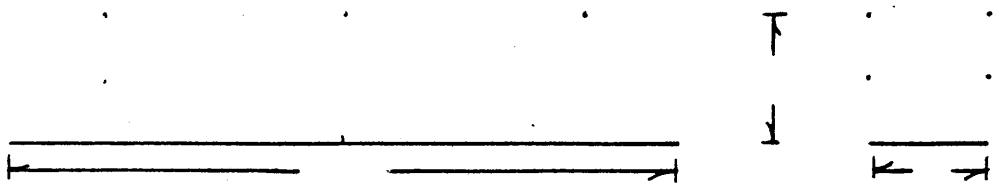
Truss Configuration

Main span type: Warren

Deck



Secondary span type: _____ Through/Pony/Deck, Skew



R-358

2473 A-23

Photo Numbers:

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Giles ; No. 35 .
~~City~~/Town: Staffordsville .
~~Street~~/Road: state route 696 (abandoned section) .
~~River~~/Stream/~~Railroad~~ (crossing): Walker Creek .
UTM/KGS Coordinates: .

12455-28: 14-21

Historical Information

Formal designation: .
Local designation: 17Ø9 (District Structure No.) .
Designer: .
Builder: .
Date: ; basis for: .
Original owner: ; use: vehicular bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: --------

Historical or Technological Significance

x ~~Unique~~/Unusual in its time: all members of this truss are angles. One of two examples of a quadrangular truss .

____ Rare survivor though of standard design: .

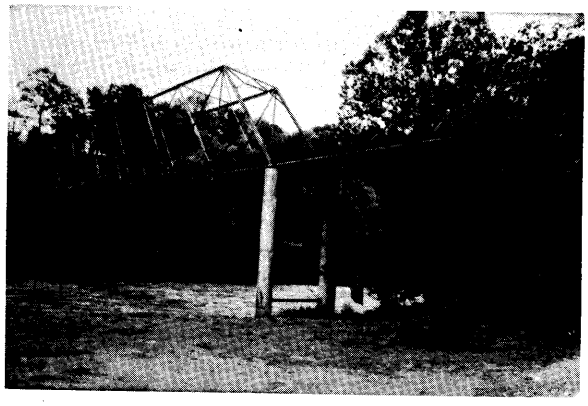
____ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: It has been abandoned as a vehicular bridge since about 1940; a route 100 was improved and a new 2-lane concrete block bridge was built further down stream in 1937. The District office has no files on this structure. .

Nature/Degree of any destructive threats: derelict, scheduled for replacement; has been abandoned for years. .

Reference materials and contemporary photos/illustrations with their respective locations:
No District Bridge Office files are kept on this span.

"Old Photograph File", Research Council



Recorder: Dan Deibler .
Date: 6 August 1975 .
Affiliation: Research Council .

2474

Design Information

Compass orientation of axis: NE/SW .

No. of spans: six (6); length; overall: 252' .

Span types:

(1) through truss ; length: 162' .
(2) steel beam ; length: 18' .
(3) steel beam ; length: 18' .
(4) steel beam ; length: 18' .
(5) steel beam ; length: 18' .
(6) steel beam ; length: 18' .

No. of lanes: one (1); width: _____ c to c.

Architectural or decorative features:

Wire mesh side railings

Structural Information

Substructure:

Material: concrete; steel .
Foundations: .
Piers: paired steel cylinders filled w/concrete; also paired steel channels .
Abutments: concrete .
Wings: concrete .
Seats: concrete .

Superstructure:

Material: steel **sources** .

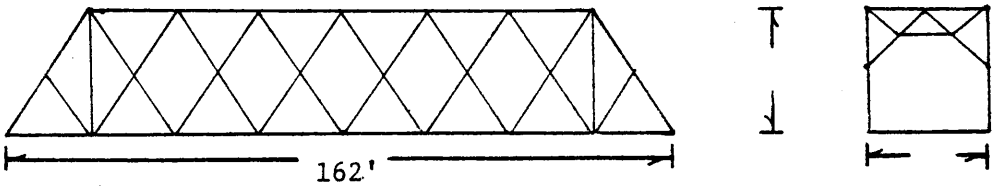
Characteristics, details and members:

Connections: _____ pin.
x rigid.

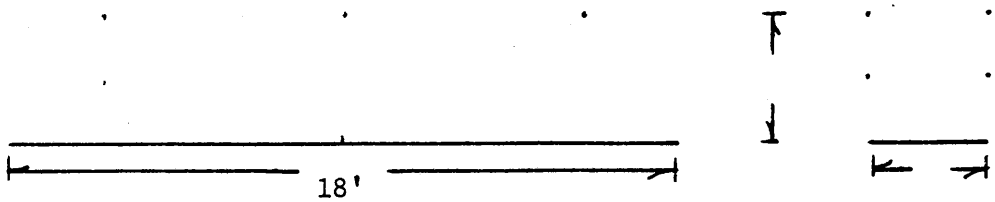
Top Chords 2 angles riveted back-to-back .
End Posts: 2 angles riveted back-to-back .
Bottom chords: 2 angles riveted back-to-back .
Posts: .
Diagonals: 2 angles riveted back-to-back .
Counters: 2 angles riveted back-to-back .

Truss Configuration

Main span type: Quadrangular (double - int. triangular) **Through**



Secondary span type: steel beam **Deck**



R-358

Photo Numbers:

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Giles ; No. 35 .
~~City~~/Town: Eggleston .
~~Street~~/Road: state route 730 .
River/~~Stream/Railroad~~ (crossing): New River .
UTM/KGS Coordinates: .

12455-32: 11-21

Historical Information

Formal designation: .
Local designation: 6Ø57 (District Structure No.) .
Designer: .
Builder: .
Date: ; basis for: no date or bridge plate .
Original owner: ; use: .
Present owner: ; use: .

Historical or Technological Significance

___ Unique/Unusual in its time: .

x Rare survivor though of standard design: one of few bridges comprised of Pennsylvania trusses .

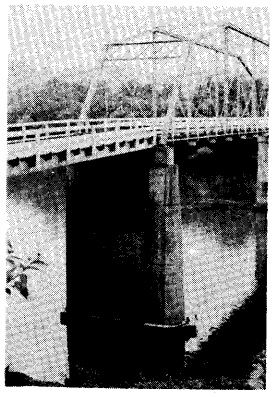
___ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: bolted splice plates indicate that trusses were relocated to this site. A similar 2-span Penn. truss bridge on this site was washed away in August 1940, a summer flood. The present trusses were moved to site and re-erected in 1941; they were previously located on route 125 at Schoolfield, now a section of Danville route; 730 was formerly route 42 .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:
BRIDGE SAFETY INSPECTION FILE, Salem
District Bridge Office

PLANS: LXXiV-11, February 1941.



Recorder: Dan Deibler .
Date: 7 August 1975 .
Affiliation: Research Council .

Design Information

Compass orientation of axis: E/W .

Architectural or decorative features:

Wood side railings

No. of spans: seven (7); length; overall: 598' .

Span types:

(1) steel beam ; length: 35' .
(2) steel beam ; length: 53' .
(3) through truss ; length: 170' .
(4) through truss ; length: 170' .
(5) steel beam ; length: 63' .
(6) steel beam ; length: 53' .
(7) steel beam 17'

No. of lanes: one (1) ; width: 14'6" c to c.

Structural Information

Substructure:

Material: concrete; steel .
Foundations: .
Piers: concrete; 1 pair concrete filled steel cylinders .
Abutments: concrete .
Wings: concrete .
Seats: concrete .

Superstructure:

Material: steel sources poss. EASTERN or CARNEGIE .

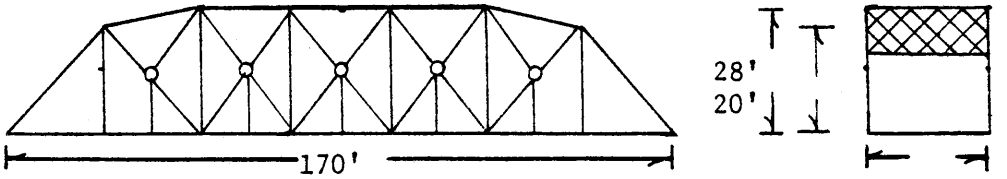
Characteristics, details and members:

Connections: x pin.
rigid.

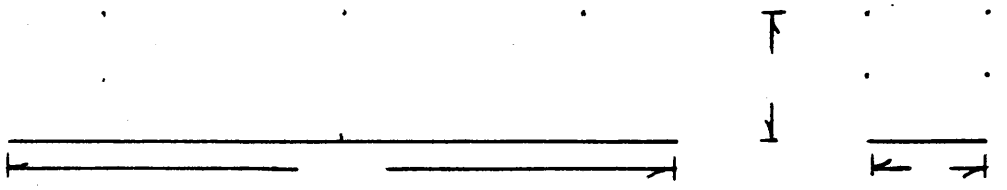
Top Chords 2 up-right channels connected w/cover plates & stay plates .
End Posts: 2 up-right channels connected w/cover plates & stay plates .
Bottom chords: double & quadruple eye bars, loop welded .
Posts: 2 vertical channels connected w/lacing bars .
Diagonals: double rectilinear eye bars, loop welded .
Counters: single rectilinear eye bars, loop welded .

Truss Configuration

Main span type: Pennsylvania Through



Secondary span type: steel beam Deck



R-358

2177 A-27

Photo Numbers:

12455-16: 1-11
12455-19: 17-21

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Henry ; No. 44 .
City/Town: w. of Sandy Level .
Street/Road: state route 622 .
River/Stream/Railroad (crossing): Smith River .
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: 6129 (District Structure No.) . Morgan Ford
Designer: .
Builder: .
Date: 1887 ; basis for: date plate intact on photo of 1935; no legible bridge plate.
Original owner: various ; use: various .
Present owner: Va. Dept. of Hwys & Transp. ; use: vehicular bridge .

Historical or Technological Significance

x Unique/Unusual in its time: the various spans in this bridge were assembled into one bridge at this site in 1953 by the department .

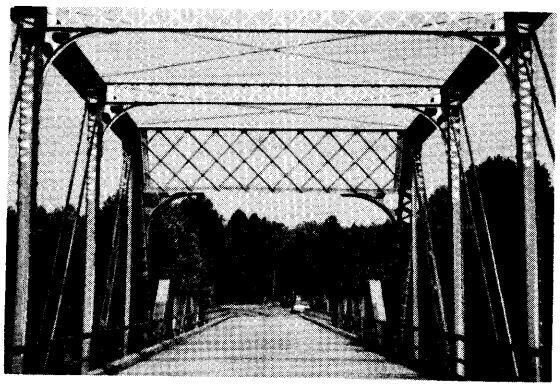
____ Rare survivor though of standard design: .

____ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: the through truss span portion of this bridge is the most unusual section of the bridge. It was formerly located in Pittsylvania County and carried route 58 over Fall Creek. The low truss is from Mecklenburg County, route 58 over Butchers Creek. The plate girders were from a N & W RR overpass in Vinton, Virginia. The steel girders are from Salem, Roanoke.

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:
BRIDGE SAFETY INSPECTION FILES, Salem
District Bridge Office
PLANS: cxvii-23;
sc-24-90 for standard 80' low truss.
Old Photographic File, V.H.&T.R.C.



Recorder: Dan Deibler .
Date: 1 July 1975 .
Affiliation: Research Council .

2473

Design Information

Compass orientation of axis: E/W.

No. of spans: five (5); length; overall: 396'.
Span types:
(1) plate girder; length: 64'11".
(2) through truss; length: 135'9".
(3) low truss; length: 80'.
(4) steel beam; length: 52'10".
(5) steel beam; length: 52'10".
(6) ; length: .

No. of lanes: two(2); width: 25' c to c.

Architectural or decorative features:

Simple channel & angle railing

Hip verticals are new "I" beams; end panel diagonals are paired back-to-back angles connected w/stay plates. End panel posts are 2 vertical channels connected w/continuous plates w/holes. Lateral struts & sway struts are paired riveted angles connected w/latticing. Sway braces are curved angles w/steel plates w/holes.

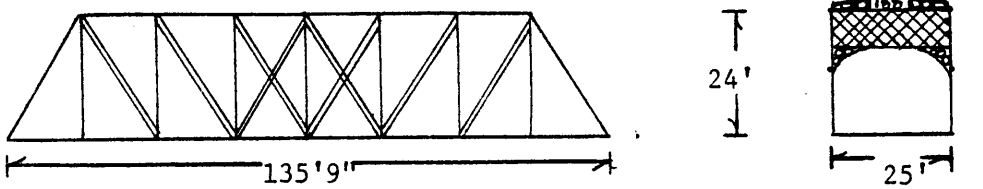
Structural Information

Substructure:
Material: concrete.
Foundations: .
Piers: concrete.
Abutments: concrete.
Wings: concrete.
Seats: concrete.

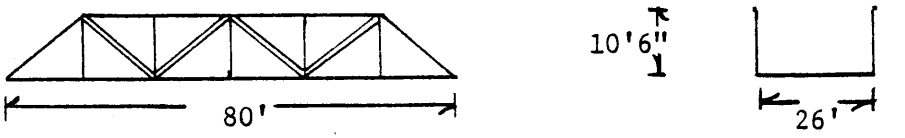
Superstructure:
Material: steel **sources** .
Characteristics, details and members:
Connections: x pin.
rigid.
Top Chords 2 built-up channels connected w/lacing bars on top & bottom.
End Posts: 2 built-up channels connected w/lacing bars on top & bottom.
Bottom chords: double rectilinear eye bars, die forged.
Posts: 2 vertical channels connected w/lacing bars.
Diagonals: double rectilinear eye bars, die forged.
Counters: paired angles connected w/stay plates.

Truss Configuration

Main span type: Pratt **Through**



Secondary span type: Triangular with verticals. **Pony**



2479 A-29

R-358

Photo Numbers:

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. 02 .
County: Montgomery ; No. 60 .
~~City~~/Town: Graysontown .
~~Street~~/Road: state route 613 .
River/~~Stream/Railroad~~ (crossing): Little River .
UTM/KGS Coordinates: .

12455-26: 6-21

Historical Information

Formal designation: 1360 (Structure Tabulation No.) .
Local designation: 6907 (District Structure No.) .
Designer: Virginia State Highway Commission, Richmond, Virginia .
Builder: Champion Bridge Company, Wilmington, Ohio .
Date: 1916-1918 ; basis for: bridge/date plate/plans .
Original owner: Va. State Hwy. Commission ; use: vehicular bridge .
Present owner: Va. Dept. of Hwy. & Transp. ; use: vehicular bridge .

Historical or Technological Significance

_____ Unique/Unusual in its time: .

x Rare survivor though of standard design: one of few multiple span trusses still located on its original site .

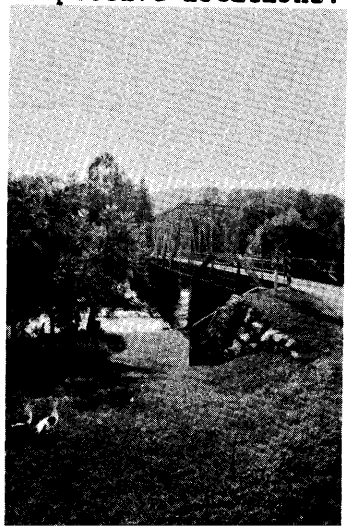
_____ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: the plans for this bridge are dated July 1916; the approach spans carry a 1917 date plate & the through trusses carry a 1918 date plate .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:
BRIDGE SAFETY INSPECTION FILE, Salem
District Bridge Office

PLANS: 0-21, 19 July 1916



Recorder: Dan Deibler .
Date: 5 August 1975 .
Affiliation: Research Council .

Design Information

Compass orientation of axis: E/W.

No. of spans: four (4) length; overall: 309'.
Span types:
(1) low truss; length: 52'9".
(2) through truss; length: 101'9".
(3) through truss; length: 101'9".
(4) low truss; length: 52'9".
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: one (1); width: 13'4" c to c.

Architectural or decorative features:

Simple 2-pipe side railings.

Lateral struts are riveted angles.

Hip verticals are angles connected w/stay plates.

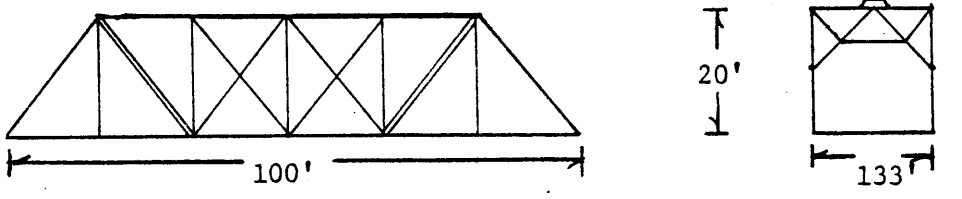
Structural Information

Substructure:
Material: concrete.
Foundations: _____.
Piers: concrete.
Abutments: concrete.
Wings: concrete.
Seats: concrete.

Superstructure:
Material: steel sources CAMBRIA.
Characteristics, details and members:
Connections: _____ pin.
x rigid.
Top Chords 2 up-right channels connected w/lacing bars top & bottom.
End Posts: 2 up-right channels connected w/lacing bars top & bottom.
Bottom chords: 2 angles connected w/stay plates.
Posts: 2 vertical channels connected w/lacing bars paralleling roadway.
Diagonals: single & double angles connected w/stay plates.
Counters: single angles.

Truss Configuration

Main span type: Pratt Through



Secondary span type: Pratt Pony

R-358

A-31

2481

Photo Numbers:

12455-41: 4-16

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Montgomery ; No. 6Ø .
City/Town: .
~~Stream~~/Road: state route 821 (formerly 637) .
River/~~Stream~~/~~Railroad~~ (crossing): NF Roanoke River .
UTM/KGS Coordinates: .

Historical Information

Formal designation: 18Ø1 (Structure Tabulation No.) .
Local designation: 6Ø45 (District Structure No.) .
Designer: King Iron Bridge & Manufacturing Company, Cleveland, Ohio .
Builder: King Iron Bridge & Manufacturing Company, Cleveland, Ohio .
Date: 1892 ; basis for: bridge/date plate .
Original owner: ; use: vehicular bridge .
Present owner: Va. Dept. of Hwys & Transp. ; use: vehicular bridge .

Historical or Technological Significance

_____ Unique/Unusual in its time: .

x Rare survivor though of standard design: this is one of the few surviving examples of a truss bridge designed & built by this company .

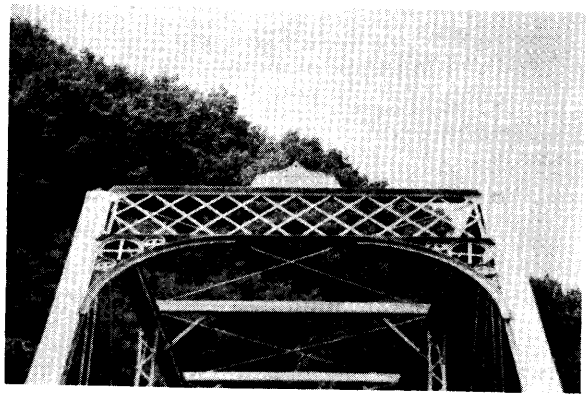
_____ Typical example of its time and a common survivor: .

x Other Remarks/Explanation: bolted splice plates on top chord panel points indicate that this truss was moved to this site. The concrete abutments suggest the same.
The original location of this truss remains unknown.

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILE, Salem
District Bridge Office



Recorder: Dan Deibler .
Date: 20 August 1975 .
Affiliation: Research Council .

2492

Design Information

Compass orientation of axis: N/SE .

No. of spans: one (1); length; overall: 106'11"
Span types:
(1) through truss ; length: 105' .
(2) _____ ; length: _____ .
(3) _____ ; length: _____ .
(4) _____ ; length: _____ .
(5) _____ ; length: _____ .
(6) _____ ; length: _____ .

No. of lanes: one (1); width: 13' c to c.

Architectural or decorative features:

Wire mesh side railings

Lateral struts have 2 angles riveted to a continuous plate w/sway braces.

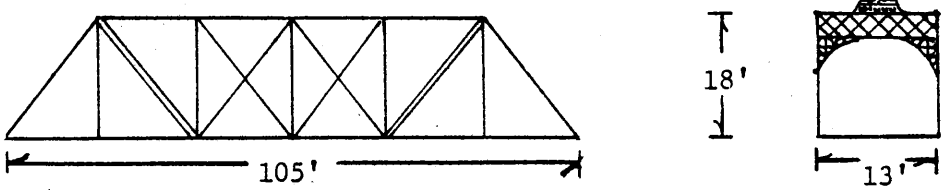
Structural Information

Substructure:
Material: concrete .
Foundations: _____ .
Piers: _____ .
Abutments: concrete .
Wings: concrete .
Seats: concrete .

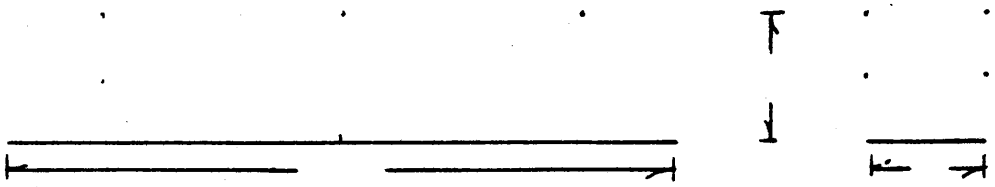
Superstructure:
Material: steel sources _____ .
Characteristics, details and members:
Connections: x pin.
_____ rigid.
Top Chords 2 up-right channels connected w/cover plates & stay plates .
End Posts: 2 up-right channels connected w/cover plates & stay plates .
Bottom chords: double rectilinear eye bars, die forged .
Posts: 2 vertical channels connected w/lacing bars .
Diagonals: double rectilinear & single cylindrical eye bars, die forged & loop welded.
Counters: single cylindrical eye bars, loop welded .

Truss Configuration

Main span type: Pratt Through/Pony/Deck, Skew



Secondary span type: _____ Through/Pony/Deck, Skew



R-358

Photo Numbers:

12455-44: 16-21
12455-46: 3-14

TRUSS BRIDGE SURVEY AND INVENTORY FORM

Geographic Information

State: Virginia
Va. Dept. of Highways District: Salem ; No. Ø2 .
County: Roanoke ; No. 128 .
City/~~Town~~: Roanoke .
Street/Road: Walnut Avenue, route 116 .
River/~~Stream/Railroad~~ (crossing): Roanoke River .
UTM/KGS Coordinates: .

Historical Information

Formal designation: .
Local designation: 1816 Walnut Avenue Bridge .
Designer: .
Builder: American Bridge & Iron Company .
Date: 1890 ; basis for: Bridge Safety Inspection File .
Original owner: ; use: .
Present owner: City of Roanoke ; use: vehicular bridge .

Historical or Technological Significance

____ Unique/Unusual in its time: .

__x__ Rare survivor though of standard design: one of few examples of Warren-type trusses .

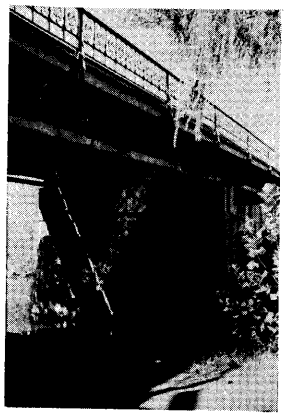
____ Typical example of its time and a common survivor: .

__x__ Other Remarks/Explanation: these trusses are similar to those used on 5th & 2nd Street bridges over the N&W tracts also in Roanoke. These trusses were raised in 1927 when northern section of bridge was built. New flooring was added in 1964 and a median was added to distribute loads away from center & increase the capacity. .

Nature/Degree of any destructive threats: .

Reference materials and contemporary photos/illustrations with their respective locations:

BRIDGE SAFETY INSPECTION FILE



Recorder: Dan Deibler .
Date: 30 October 1975 .
Affiliation: Research Council .

Design Information

Compass orientation of axis: N/S.

No. of spans: two (2); length; overall: 160'.
Span types:
(1) low truss; length: 80'.
(2) low truss; length: 80'.
(3) _____; length: _____.
(4) _____; length: _____.
(5) _____; length: _____.
(6) _____; length: _____.

No. of lanes: two (2); width: _____ c to c.

Architectural or decorative features:

The two external side walks have rather elegant side railings.

Trusses are joined at the center pier along top chord members making a continuous truss.

Structural Information

Substructure:
Material: limestone; concrete.
Foundations: _____.
Piers: coursed, rusticated, limestone masonry w/broken surfaces.
Abutments: uncoursed, random cut limestone masonry.
Wings: uncoursed, random cut limestone masonry.
Seats: concrete.

Superstructure:
Material: _____ sources _____.
Characteristics, details and members:
Connections: _____ pin.
x rigid.
Top Chords 2 up-right plates connected to cover plate w/riveted angles.
End Posts: paired back-to-back angles connected w/lacing bars.
Bottom chords: built-up "T" shaped members.
Posts: _____.
Diagonals: paired continuous plates riveted only @ top & bottom chord connections.
Counters: paired back-to-back angles connected w/lacing bars.

Truss Configuration

Main span type: Warren/trangular Pony

Secondary span type: _____ Through/Pony/Deck, Skew