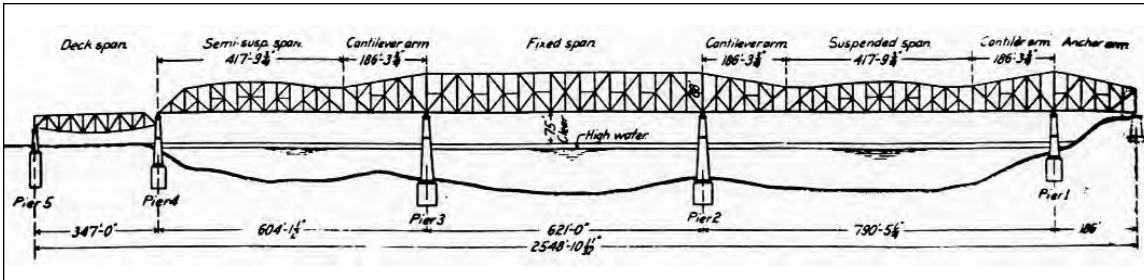


(#77) 79-NonHighway-4: Harahan Bridge spanning the Mississippi River in downtown Memphis on the Tennessee-Arkansas state line, Shelby County (Northwest Memphis Quad, 404 NE).



Significant under Criterion A for its role in overland transportation and for expanding development into West Memphis and under Criterion C for its engineering merits.

As rail traffic in Memphis increased after the construction of the Frisco Bridge (#14, 79-NonHighway-3), local citizens represented by Representative Kenneth McKellar and officials from the Rock Island Railroad initiated efforts to build a second bridge across the Mississippi River at Memphis. The Memphis and Arkansas Bridge and Terminal Company, Cotton Belt Southern Railway, and the Missouri Pacific rail line also participated in the project. Throughout 1912 local interests and railroad officials argued over the issue of trolley cars, who would build and maintain the approaches for vehicular traffic, and vehicular tolls. The various interests finally agreed that the railroads would build the vehicular lanes on the bridge but that local

interests would build and maintain the approach spans which were to be free. The arrangement eliminated trolley cars. The railroads also agreed to pay the City of Memphis \$50,000 for street closures. Since the viaduct and trolley lines more directly affected Arkansas, many citizens in Arkansas viewed the arrangement as unsatisfactory, and the vehicular viaduct remained a source of controversy throughout its existence.

The nationally significant bridge designer Ralph Modjeski, designed and supervised the erection of the Harahan Bridge. Modjeski was born in 1861, in Crakow, Poland, as Rudolphe Modrzejewski. In 1876 his family moved to America intending to live in a Polish Artists colony or a commune in California. However, they soon left California and Modjeski's mother, a famed actress, resumed her career with son Modjeski as her manager. It was at this time that he changed his name. After considering becoming a professional pianist, Modjeski chose to pursue engineering. He trained in Paris at the E'cole des Ponts et Chaussees from 1881 to 1885 and graduated at the head of his class with a degree in Civil Engineering. During this time he became a naturalized United States citizen.

Modjeski's first job upon his return from Paris was with George Morison, one of the country's most prominent engineers (see the Frisco Bridge, #14, 77-NonHighway-3). While working for Morrison on the Frisco Bridge, he served as chief draftsman, chief inspector, and assistant engineer over construction. Modjeski trained under Morison until 1892 when he left to open his own firm in Chicago. Like Morison, Modjeski was best known for his work in railroad bridges, but unlike Morison who specialized in metal trusses, Modjeski worked with a variety of bridge types.

In 1894, Modjeski began work on his first major project on his own, a seven span railway and highway bridge spanning the Mississippi River at Rock Island, Illinois. He developed a set of standard bridge designs for the Northern Pacific Railroad that the line used for many years. In 1902 Modjeski formed a partnership with Alfred Noble (who had also worked on the Frisco Bridge). With Noble, Modjeski first achieved national recognition with the 1905 design for a railway bridge spanning the Mississippi River at Thebes, Illinois. Between 1904 and 1915 he designed a series of bridges in Oregon. In 1907 the collapse of the Quebec Bridge, spanning the St. Lawrence River, attracted worldwide attention. In 1908, Canadian authorities appointed a three-man advisory commission for the design and construction of the new bridge. It was a mark of Modjeski's prominence that he was chosen to represent American engineers and served on the commission until completion of the bridge in 1918. Historian Carl Condit credits Modjeski with reintroducing K-trussing to North America through its use on the Quebec project (Condit 1960, 1968). As an independent engineer, Modjeski designed the 1910 McKinley Bridge spanning the Mississippi River at St. Louis, a double track rail and vehicular bridge. Modjeski also designed the 1912 Cherry Street Bridge spanning the Maumee River in Toledo, Ohio, the first of several concrete bridges that he designed.

Modjeski returned to Memphis in 1914 to design the Harahan Bridge, a joint rail and vehicular bridge spanning the Mississippi River immediately adjacent to the Frisco Bridge. Until 1930 this was the only vehicular bridge spanning the lower Mississippi. Historian David Plowden states that due to:

its proximity to Morison's landmark, Modjeski's achievement has always been eclipsed, increasingly so after a new highway bridge was built on the other side of it. As part of a trilogy of cantilevers, representing one of the most impressive

masses of steelwork to be found anywhere, the Harahan is lost. Had it stood alone, no doubt it would have been recognized as one of America's major railroad bridges (Plowden 1974:172).

During the 1910s, Modjeski designed a railway and highway bridge spanning the Mississippi River at Keokuk, Iowa; a railway bridge spanning the Ohio River at Metropolis, Illinois; and a railway bridge spanning the Thames River at New London, Connecticut. Between 1920 and 1924, he rebuilt two bridges under traffic at Cincinnati and at Omaha. Until the 1920s, Modjeski had primarily worked with metal trusses. However, in 1920 he was hired as chief engineer for a suspension bridge spanning the Delaware River at Philadelphia. The Philadelphia-Camden Bridge, now known as the Benjamin Franklin Bridge, at its completion in 1926, was the longest suspension bridge in the world. Some engineers consider it to be his largest and single most important design (Durand 1944).

In 1923, Modjeski formed a partnership with Frank Masters and later Clement Chase and, after Chase's death in 1933, with Montgomery Chase. Based in Pennsylvania, this firm built a wide variety of bridges across the country. One of the best known bridges by this firm is the 1933 Huey P. Long Bridge spanning the Mississippi River at New Orleans, a joint highway and railway bridge. This was the fourth bridge spanning the lower Mississippi, and Modjeski had worked on three of the four. Modjeski's last major project was the San Francisco-Oakland Bay Bridge. In 1931 he was appointed Chairman of a Board of Consulting Engineers for the bridge which, though overshadowed by the concurrent development of the Golden Gate Bridge, was at that time the longest major highway and electric railway bridge in the world. Due to failing health, Modjeski moved to California in 1936 in order to work on this project (Durand 1944; Modjeski and Masters 1990).

Upon Modjeski's death in 1940, an obituary in the *New York Times* praised him as "the World's leading bridge builder" (Duszak 1986). Plowden credits him with being the chief engineer in charge of the construction or the rebuilding of thirty of America's major bridges, "four of which hold records and have attained the status of classics" (Plowden 1974:171).

In addition to Modjeski, the crew for the Harahan Bridge in Memphis included W. E. Angieras, assistant chief engineer and M. B. Case as resident engineer. Modjeski and many other crew members had previously worked on the Frisco Bridge project which was 200 feet downstream from the Harahan Bridge. This close proximity necessitated a parallel substructure placement for river traffic and thus spans of similar lengths. Construction lasted from late summer 1913 through February 1917, and the project cost nearly \$6 million. High waters repeatedly plagued the project and delayed construction. The deaths of twenty three laborers also marred construction activities.

Modjeski let a contract 1 June 1913 for the substructure to the Union Bridge and Construction Company of Kansas City. (This company's president L. S. Stewart had been Superintendent of Construction for the Frisco Bridge.) In November 1913 caisson work began for the piers. The piers are of concrete, faced with granite, and rest on pneumatic caisson foundations which in turn rest on the clay riverbed. Workers built the foundation for the anchor pier in open excavation while they built the foundations for piers one through five by sinking caissons by pneumatic process. During construction on the caisson for pier five on 9 April 1914, during shift change as the old crew left safely, poisonous gases in the locking in process killed the in-coming crew of nine men.

The contract for the superstructure was let to Pennsylvania Steel Company of Philadelphia. The bridge carries two rail lines within the trusses and 14-foot vehicular roadways cantilevered out from each side of the truss. From east to west, the main section of the bridge contains one 186-foot anchor arm span, one 790-foot channel span, one 621-foot fixed or center span, and one 604-foot shore span all comprising the pin-connected continuous truss section. This truss fits no easy classification but reflects Petit influences with its subdivided panels. To the west is a 347-foot deck Warren. A combination of carbon steel and a nickel-chrome alloy, known as "Mayari Steel" that was manufactured from Cuban ores, forms the superstructure.

The contract for the second major section of the bridge, the approach viaduct on the Arkansas side, was let to Virginia Bridge and Iron that operated a plant in Memphis. The viaduct is 2,364 feet long and contains plate girder spans on steel towers on concrete piers. Twenty 80-foot girder spans alternate with nineteen 40-foot tower spans.

In the summer of 1916 crews finished the bridge, which included two 14-foot "wagonways" for vehicular traffic and an approach viaduct for rail traffic on the Arkansas side. The only major feature not built by then was the vehicular approaches. On 14 July 1916, the first train crossed the bridge for a dry run and the following day the bridge officially opened. Over the previous two years, the Chamber of Commerce had planned elaborate dedication ceremonies that included raising \$100,000 and appointing over thirty committees. However, due to the involvement of the United States in World War I, the chamber decided it was inappropriate to hold such ceremonies and announced that it would postpone the ceremonies until the contractor had completed the vehicular viaduct later in the year. The ceremonies were never held. The railroads named the bridge in honor of J.T. Harahan, president of the Illinois Central Railroad and proponent of the bridge, who died in a train wreck in 1912.

The vehicular viaduct, to be built and maintained by local groups, was a source of controversy throughout its existence. On the Tennessee side, approach work was simple as the anchor arm rested on a bluff and the only work needed was to connect the truss span with local roads. The Arkansas side was far more complex as that end of the truss span stopped in Crittendon County about 75 feet above the ground in a flood prone bottom two miles away from the 1895 St. Francis Levee. Arkansas blamed Memphis leaders and Senator McKellar for agreeing to an arrangement that benefited Memphis but left Arkansas with a substantial obligation to build and maintain the viaduct that the trolley car prohibition exacerbated. As fund-raising for the \$50,000 viaduct proved difficult, dissension between Arkansas and Memphis residents increased. Finally, the vehicular viaduct opened 5 September 1917. While its wood construction on a steep three percent grade may appear crude in hindsight, at the time it was considered quite superior to the previous ferry system.

Up to the 1910s, much of this area of Arkansas had been swampland, but improved canals and drainage methods allowed farmers to convert acreage for use as cotton fields. As a result, better access between agrarian Arkansas and the urban trade center of Memphis became necessary. Initially, local leaders planned to extend the viaduct toward an existing town in Arkansas, but for various reasons, it went further south toward a logging camp known as Bragg's Spur. Along this corridor at Bragg's Spur a new town named West Memphis developed. West Memphis was incorporated in 1927 (the year construction on a new viaduct began), and between 1930 and 1940, the population nearly quadrupled. Today it is a major town in this area.

When the viaduct on the Harahan Bridge opened in 1917, it was the only bridge spanning the Mississippi south of the Ohio River confluence to carry vehicular traffic and remained so until 1930 when a combined railroad-highway bridge was built at Vicksburg, Mississippi. As such, the Harahan Bridge was a vital link in regional and transcontinental transportation networks such as the Lee Highway, the Bankhead Highway, and the U.S. and state route systems. A booster publication from 1929 noted that "seven highway arteries of national importance converge at Memphis to cross the Mississippi on the Harahan Bridge...the physical link that makes Memphis the gateway for all this tourist travel" (Volunteer 1929:63). Between 1935 and 1940 four other bridges spanning the Mississippi River south of the Ohio River confluence were built. The next bridge built south of the confluence was the Memphis-Arkansas Bridge which opened in 1949 (#156, 79-I055-12.00). Since then eight other bridges have been built over the "true" Mississippi.

By the early 1920s, local citizens proposed a new viaduct, and a toll placed on the viaduct in 1924 exacerbated this pressure. In 1923, Memphis leaders proposed to build a new viaduct and to improve the vehicular lanes. After direct lobbying by Memphis leaders, the U.S. Commissioner of Agriculture, whose agency administered the Bureau of Public Roads, visited Memphis in 1924 and agreed that each state could use federal highway money for such a project. For two years, negotiations continued between Tennessee and Arkansas over how to split the cost. Tennessee Commissioner of Highways, J. C. Creveling, agreed to pay half the costs of the truss portion since it spanned the state line. However, he refused to pay for any of the costs of the viaduct since it was entirely within Arkansas. Under intense pressure from West Tennessee leaders, the U.S. Bureau of Public Roads and Tennessee Governor Austin Peay ordered Creveling to authorize funds for the viaduct. Rather than participate in what he believed to be an illegal appropriation, Creveling resigned 21 October 1925.

The next highway commissioner approved Tennessee funding for the viaduct. On 6 February 1926, participants signed a financial agreement in which Memphis, the Harahan Viaduct Improvement Association (composed of eight Arkansas Counties), Arkansas, and Tennessee agreed to fund the \$1.7 million viaduct. The contract for the new viaduct was let 25 July 1927. A fire in September 1928, which resulted in motorists being ferried across the river for two months, heightened interest in the new viaduct. The new concrete viaduct opened 10 July 1930.

When the Memphis and Arkansas Bridge (79-I055-12.00, a continuous truss designed by the firm of Modjeski and Masters) opened in 1949, Crittendon County and Arkansas closed the Harahan Bridge Viaduct and tried to sell both it and the roadway for scrap. Memphis opposed the move, saying that the old roadway should be left in case it was needed for emergencies. Lengthy court proceedings followed. Ultimately, President Harry Truman intervened and directed that although the decking could be removed, the vehicular roadways should remain intact for emergency use. Today the Harahan Bridge is a vital link in the rail system, but the roadway and viaduct remain closed to traffic (Case 1915; Fraser 1986; Johnson 1978b; Lee 1979; Macpherson 1969; *Memphis Commercial Appeal* 1916-1917; Memphis Library Clipping File; *Memphis News Scimitar* 1925-1953; Modjeski 1917; Tennessee 1959).