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Truss Bridges for Medium Spans

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I believe that we as a profession are guilty of having neglected the truss bridge, frequently the best candidate for the most economical and aesthetically pleasing solution for medium span lengths, say 100 to 500 m and beyond. I have collected slides of 19 American steel bridges to examine their aesthetics together.

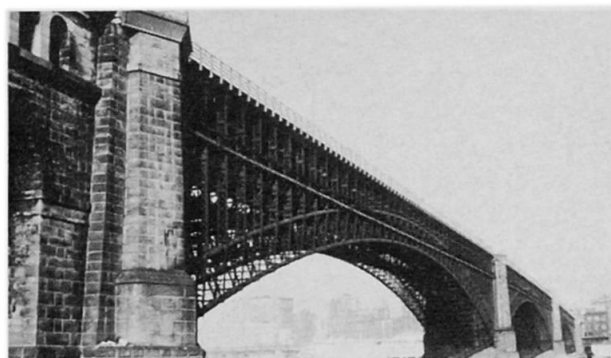
The first bridge in America that used steel for some of its structural members is the Eads Bridge (Figure 1) crossing the Mississippi River at St. Louis with three graceful arches. Completed in 1874, it has a center span of 158 m. The first all steel spans were these trusses (Figure 2) carrying a railroad over the Missouri River near Glasgow, Missouri. It was completed in 1879. Most of you are familiar with the Brooklyn Bridge (Figure 3) over East River in New York City. It was the first suspension bridge with steel cables and stiffening trusses. Although it was completed in 1883 and the surrounding landscape has changed considerably, I think you will agree with me that it blends with the backdrop very well. The most acclaimed structure designed by the famous bridge designer Gustav Lindenthal was the Hell Gate two-hinged arch (Figure 4) completed in 1917. The stone towers were practically an architectural requirement for major bridges of that day. Stone towers were also planned for the George Washington Bridge (Figure 5) over Hudson River in New York City. However, the public liked the steel towers and the builders decided to omit the stone (Figure 6). George Washington Bridge was designed by another famous bridge designer Othmar Amman, who also designed the graceful Bayonne arch over Kill Van Kull (Figure 7). When completed in 1931, it was the longest arch in the world spanning 504 m. Most of you are also familiar with Golden Gate Bridge (Figure 8) in San Francisco. During the 30's when Golden Gate was under construction, any color was acceptable for bridges as long as it was black. However, the public liked the red lead primer so much that the builders decided to make the final coat the same colour and Golden Gate has remained red ever since.

Another graceful suspension structure is the Walt Whitman bridge (Figure 9) in Philadelphia over the Delaware River. This five-span truss (Figure 10) has been acclaimed by many as one of the most graceful structures fitting perfectly its surroundings. It carries a railroad over Pecos River near the Mexican border in Texas. The traffic from downtown Philadelphia to the International Airport crosses the Penrose Avenue Bridge (Figure 11), a double cantilever truss with the center span of 207 m. Another double cantilever truss, this time combined with a tied arch of 344 m (Figure 12), carries traffic over Panama Canal at Thatcher Ferry. Many of the remaining bridges are on our interstate highway system. I-80

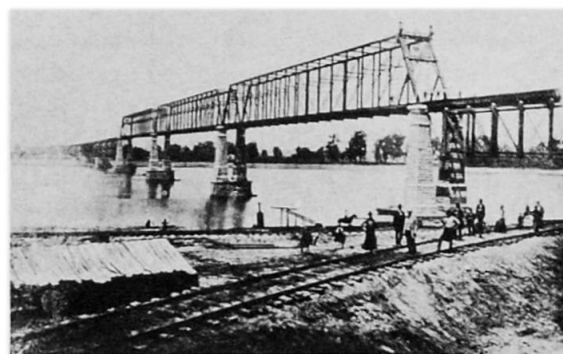


is carried over the Clarion River in Western Pennsylvania by this three-span continuous truss (Figure 13) and I-84 crosses the Hudson between Newburg and Beacon (Figure 14) – also a continuous truss. A parallel twin structure of identical design is under construction. Another continuous truss, the Betsy Ross Bridge in northeast Philadelphia (Figure 15) over the Delaware; and a cantilever bridge over Atchafalaya on I-10 in Louisiana (Figure 16). This double cantilever (Figure 17) was painted gold to fit its arid semi-desert surroundings. It carries a road over Warm Springs Creek in California (Figure 18); a beautiful, airy, but nevertheless stiff structure. I-95 has two levels on the Girard Point Bridge (Figure 19) in Philadelphia across the Schuylkill River. A new record arch was erected in 1977 over New River gorge in West Virginia (Figures 20 and 21). It is built of weathering steel – it needs no painting. And, my favorite structure is this twin arch Mississippi crossing (Figure 22) on I-40 near Memphis, Tennessee. A real work of art (Figure 23).

The 19 bridges were selected for my presentation because they have two things in common: first, each of them has trusses as major load carrying structural elements. And, second, each of them has been acclaimed by the public as well as by professionals as a beautiful bridge. Unfortunately, the progress in the design of truss bridges has not kept pace with other types. An early correction of this deficiency is likely to result in many more truss bridges during the coming decades with the design community exploiting both their economy and the aesthetic opportunities that they offer.



1. James B. Eads Bridge



2. Glasgow Bridge over Missouri River



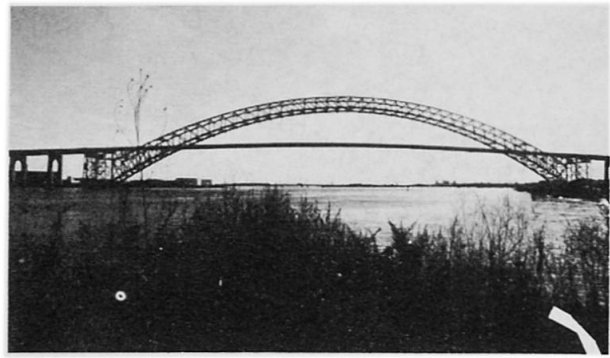
3. Brooklyn Bridge



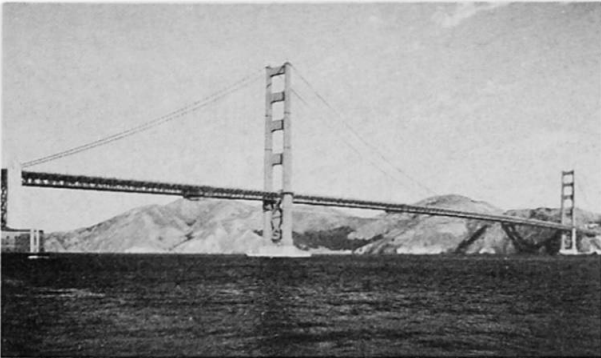
4. Hell Gate Bridge



5. George Washington Bridge



7. Bayonne Bridge



8. Golden Gate Bridge



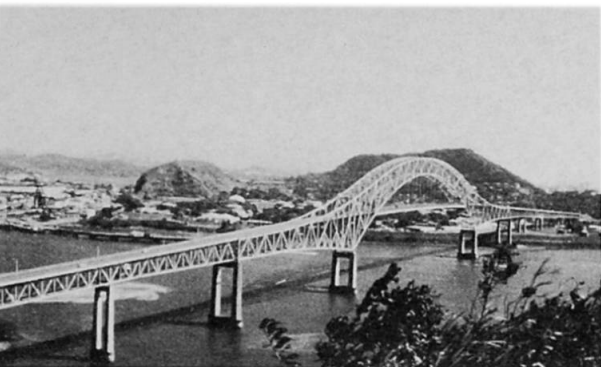
9. Walt Whitman Bridge



10. Pecos River Bridge



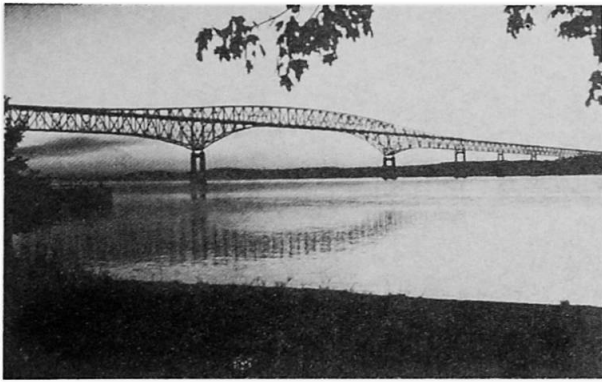
11. George Platt Bridge



12. Thatcher Ferry Bridge over
Panama Canal



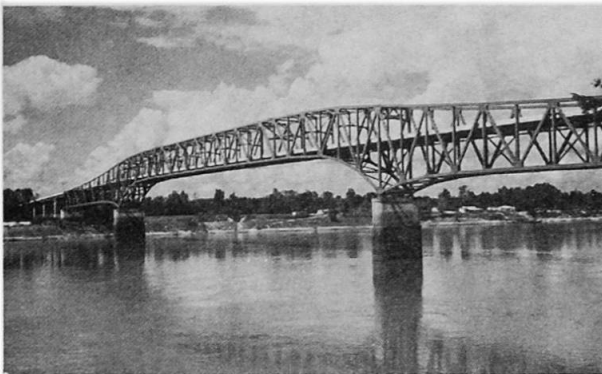
13. Clarion River Bridge on I-80



14. Newburg-Beacon Bridge



15. Betsy Ross Bridge



16. Atchafalaya, Pointe Coupe, LA Crossing



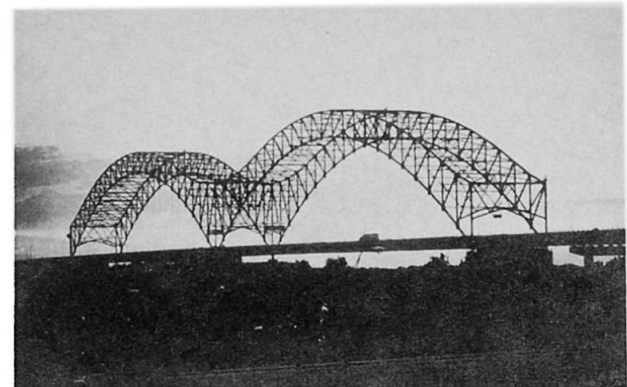
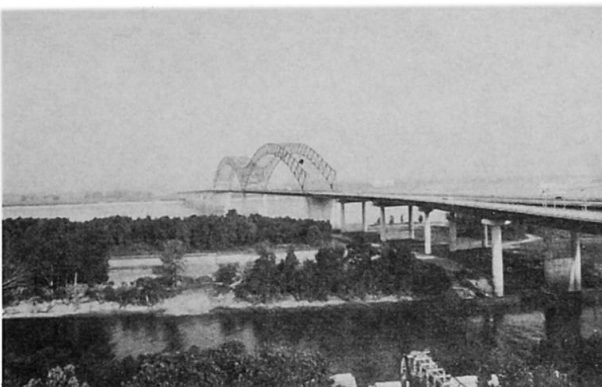
17. Warm Springs Creek Bridge



19. Girard Point Bridge



21. New River Gorge Bridge



22. 23. Twin Arch Mississippi Crossing at Memphis