
Refurbishing of the Nibelungen Bridge in Worms, Germany

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The original bridge was opened to traffic in 1900. It consisted of three, two-centered steel arches, with the carriageway superimposed, which were supported on pillars with caisson foundations. The shore bridges are solid, three-centered arches made of tamped concrete faced with natural stone. The present Nibelungen Bridge in Worms forms part of federal highway 47 and links the municipalities of Worms and Bürstadt. The bridge has a total length of 745 m and is divided into three part structures of differing construction consisting of the same 109 m long shore bridge on the left side of the Rhine in Rhineland-Palatinate, the 351.8 m long center part of the bridge crossing the Rhine (*Fig. 1*) and the shore bridge on the Hesse side of a total length of 295.5 m. The current traffic volume amounts to some 23 000 vehicles every 24 h, with a moderate heavy vehicle share of 8.7%.

In the case of the shore bridges, the 12 three-centered arches made of tamped concrete are still in existence. Solid sandstone faces the front side of the 11.4 m-wide arches and the areas directly in front of the hinges. The thickness of the arch lies between 0.67 m at the apex and c. 1 m at the quarter points of the arches. The arches are designed as compound curves with a radius of between 33 m in the case of the largest arch and 26 m in the case of the smallest one. The transverse prestressed carriageway plate made of B 450 quality concrete, incorporated in 1953, is supported over the whole surface in the crown area and above the masonry segments of the arches in the other areas. It is connected three times above the crown and impost hinges in each arch. Traffic used to drive directly on the carriageway plates, as was quite usual for the first prestressed concrete bridges. Between 1972 and 1974, the bridge was completely sealed using a mastic seal, and in the 42 transverse joints, single-seal expansion joints were provided. In the area of the shore bridges, the expansion joints had to be extensively touched up in 1981. Other preservation measures are in keeping with normal maintenance practice. In his lecture at the general meeting of the German Concrete Association (DBV) in Berlin in May 1952, Finsterwalder¹ himself presented the fundamental design idea of cantilevering in prestressed concrete that