Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 82 (1999)

Artikel: Seismic design for the Cape Girardeau cable-stayed bridge
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DOI: https://doi.org/10.5169/seals-62117

Seismic Design for The CapeGirardeau Cable-Stayed Bridge

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Abstract

In 1927, the Missouri Highway Department, now the Missouri Department of Transportation, constructed a 1450-meter crossing of the Mississippi River near Cape Girardeau, Missouri. Now this two lane bridge is scheduled for replacement with a new four lane cable-stayed structure.

In 1927, the Missouri Highway Department, now the Missouri Department of Transportation, constructed a 1450-meter crossing of the Mississippi River near Cape Girardeau, Missouri. Now this two lane bridge is scheduled for replacement with a new four lane cable-stayed structure.

The proposed structure has an overall length of 1206 meters, and was designed in both concrete and steel alternatives for competitive bidding purposes. The main span unit is comprised of a three-span, 636-meter cable-stayed unit with a 350-meter navigation span. The approaches are of typical steel plate girder construction.

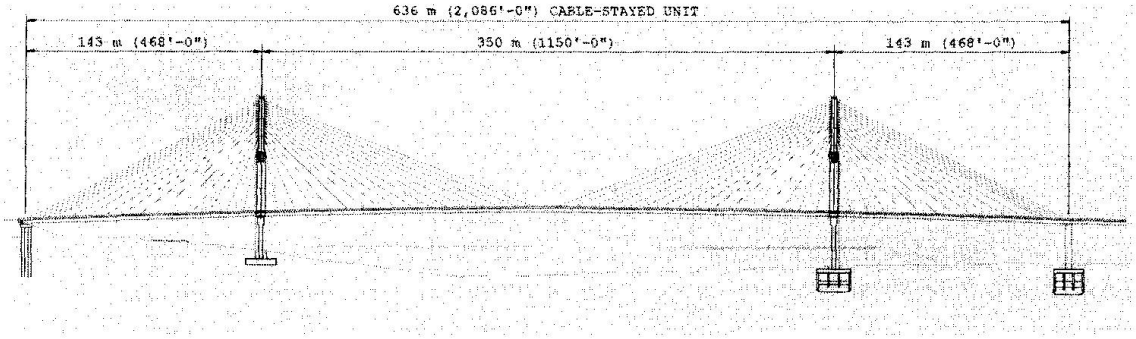

Figure 1

This new bridge is located within the New Madrid Seismic Zone, the location of three of the largest seismic events to occur within the interior of a tectonic plate and the site of the most violent series of earthquakes ever recorded, and is a candidate to experience a significant earthquake within its design life. Although not actually recorded, studies of the available data indicate that the events of the winter of 1811-1812 had surface wave magnitudes (M_s) of about 8.6, 8.4, and 8.7 and it is suggested that the recurrence interval of magnitude 8 earthquakes in this region is approximately 550 to 1200 years.

In addition to the probability of a significant earthquake, the geology of the site may be characterized as having deep, liquifiable soils which are subject to frequent flooding and the potential for extensive scour. These site conditions, combined with the significance of the design earthquake event, generated some unique design challenges.

The design issues presented will demonstrate the methodology used to consider the significance of the design earthquake, the site specific ground motion, and the effect of liquefaction and lateral spreading forces on this structure.