Challenges and solutions for design of a 920m seven-span continuous girder bridge with high piers in a high-intensity seismic zone of Central Asia

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Abstract

The Tajikistan Long Bridge serves as a crucial transportation hub in the Obigarm-Nurobod road project, and its structural safety is of utmost importance to Tajikistan's regional transportation and economic development. The bridge is a seven-span FCM continuous beam/continuous rigid frame composite system bridge, with a span arrangement of 85m+5×150m+85m. Located in a high-intensity earthquake zone with a peak ground acceleration of 0.678g, the bridge is designed according to the AASHTO specifications. In this paper, a three-dimensional finite element model is established to analyze the static and dynamic characteristics of the bridge. Addressing design issues such as excessive negative reaction forces on bearings and an excessively low demand ratio for pile foundation structural capacity caused by high-intensity earthquakes, numerical results under different design schemes and seismic design measures are compared. Ultimately, the structure adopts a scheme where P2P3 piers are rigid,

while the remaining piers serve as bearings. In terms of seismic design measures, an elastic cable + steel damper scheme is adopted, effectively solving the problems of excessive negative reaction forces on bearings and peak seismic internal forces in pile foundations. This provides a reference for similar bridge designs.

***Keywords**: Seven-span FCM; Continuous beam/continuous rigid frame composite system; High-intensity earthquake; AASHTO; Seismic design measures*