PROGRAMA DE DOCTORADO EN INGENIERÍA CIVIL

MÁSTER DE ESTRUCTURAS

ciencia e ingeniería de estructuras

Seismic Fragility of Long Span Steel Railroad Bridges in North America

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Seismic Fragility of Long Span Steel Railroad Bridges in North America

This presentation will introduce the concept of seismic fragility explaining one practical application for the seismic assessment of steel railroad bridges with long spans and tall piers. A seismic evaluation was conducted of a railway bridge crossing the Mississippi River in Memphis, Tennessee. Memphis is located in the Central United States in a region characterized by large but infrequent earthquakes. This is an historic bridge built on deep soil in 1894. The main span of the bridge is 240.92 m (790 feet) long, and the tallest pier stands 40.24 m (132 feet) above its caisson. The analyses of the bridge revealed that the superstructure of the bridge is very flexible transversely and that the cross bracing members between the upper and lower chords and the stone piers are the most vulnerable components under seismic loads. Rocking of the piers in the longitudinal direction and sliding of the piers in the transverse direction were the main types of behavior investigated for the stone piers. Experimental shake table investigations were conducted to verify that the analytical model could accurately represent the sliding and tilting behavior of the piers. Fragility curves for Minor and Major Damage and Collapse were developed for the bridge. Analyses based on sliding on layers in the stone piers, indicate that the bridge has about a 20% chance of collapse in the transverse direction for the 2/50 seismic hazard.

Professor Douglas A. Foutch, SE, Ph. D.

Douglas A. Foutch holds a B.S. (University of Illinois 1970), M.S. (University of Hawaii 1972) and Ph.D. (California Institute of Technology 1976), all in Civil Engineering. He joined the faculty of the Department of Civil and Environmental Engineering at the University of Illinois in 1976. Dr. Foutch has taught graduate and undergraduate classes in design of steel structures, design of structural systems, structural dynamics and earthquake engineering. Dr. Foutch is a member of the American Society of Civil Engineers (ASCE) and the Earthquake Engineering Research Institute (EERI) and has served as the Associate Editor of Earthquake Spectra published by EERI and Journal of Bridge Engineering published by ASCE. He led the Steel Team for the FEMA 273/274 project and also the Team for Performance Prediction and Evaluation for the FEMA 350 project. Dr. Foutch has served as a consultant on several major projects including a major cable-stayed bridge crossing the Mississippi River and an elevated mass transit system in Taiwan. Dr. Foutch was awarded the Haliburton Education Leadership Award by the College of Engineering in 1992. He was awarded the Arthur M. Wellington Research Prize by ASCE in 1990 and 1998. In 1994 he was awarded the Norman Medal by ASCE. He was named as a Distinguished Visiting Scholar by the Japan Society for the Promotion of Science in 1994. Dr. Foutch has research interests in the areas of response of steel and reinforced concrete bridges and buildings to earthquake loads, response of railway bridges to revenue traffic and testing and evaluation of full-scale structures. Dr. Foutch is a worldwide expert in the area of seismic fragility.

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