Fatigue and Fracture of Highway Steel Bridges - Research and Practice

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Host: Prof. H. Ling

Fatigue damage in highway steel bridges would occur under cyclic truck traffic loadings with increase of the bridge service years. Depending on the toughness of steel material, fatigue crack length and temperature, sudden fracture may happen due to cross section loss of bridge members, which would result in a partial failure or even entire bridge collapse. In the past decades, numerous fatigue damages and a few brittle fracture failures have been reported throughout the US. These include load-induced fatigue, distortion-induced fatigue, as well as fatigue or non-fatigue induced fracture. To prevent fatigue and fracture failures in steel bridges, AASHTO has provided fatigue design criteria and fracture control requirements as one of the structural limit states for highway bridge design. These design criteria have been updated over the years based on the advanced researches and experience learned from practice and failures. Good detailing for better fatigue resistance, bridge redundancy and repair/retrofit of damaged bridges are also important issues. This presentation will present examples of historical fatigue and fracture failures in steel bridges, fatigue and fracture analysis including fracture mechanics and practical approach, state-of-the-art research related to fatigue of steel bridges and orthotropic decks, and real-world practice of fatigue damage and maintenance.

Short Bio: Dr. Cheng received her Bachelor degree from Tsinghua University, China and Doctoral degree from Nagoya University, Japan. Before she joined New Jersey DOT, she has been working with Public Works Research Institute (PWRI) of Japan Ministry of Construction and ATLSS Research Center of Lehigh University as a researcher. Her major research interests include fatigue & fracture, repair & retrofit of steel structures (bridges, Navy ship structures and highway traffic structures), bridge loads & evaluation, seismic design and analysis, and so on. She is actively serving various committees/panels for ASCE (American Society of Civil Engineers), TRB/NCHRP (Transportation Research Board), AASHTO/NSBA (National Steel Bridge Alliance) Collaboration, and State research projects.

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