UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

Distinguished Lecture Series

Professor P. Benson Shing
University of California, San Diego

Bond Strength and Development Lengths of Large-Diameter Reinforcing Bars in Well-Confined Concrete

Friday, September 21, 2012
12:00 – 1:00 p.m. Seminar
Room L2D2, Engineering Lecture Hall, UH

Abstract

The bond strength and bond-slip behavior between reinforcing steel and concrete have been extensively studied over the last few decades. However, data on the bond strength and bond stress-slip behavior of large-diameter bars are scarce. The development length requirements in ACI 318 and AASHTO LRFD Specifications are largely based on experimental data obtained from No. 11 and smaller bars, and these specifications do not allow lap-splicing of bars larger No. 11 because of the lack of experimental data.

A study has been carried out at UCSD to characterize the bond-slip behavior of large-diameter bars subjected to monotonic and cyclic loadings with an ultimate goal of identifying the minimum development length required for longitudinal column reinforcement extended into an enlarged CIDH pile. For large-diameter bridge columns, reducing the splice or development length required for the longitudinal reinforcement can lead to substantial savings in construction costs and efforts.

The study includes basic bond-slip and bar pullout experiments as well as detailed nonlinear finite element modeling of the bond-slip behavior in column-shaft assemblies. In the bond-slip and bar pullout tests, the specimens were well confined to simulate the condition in a pile. A cyclic bond-slip model has been developed and calibrated with results of these tests. In addition, two full-scale column-shaft assemblies were tested to validate the design recommendations and finite element models developed in this study. This presentation provides an overview of the research program and highlights some of the major findings.

About the speaker:

Professor P. Benson Shing is a Professor of Structural Engineering at the University of California, San Diego. He earned his B.S., M.S., and Ph.D. degrees from the University of California at Berkeley. Prior to joining UCSD, he was on the Civil Engineering faculty at the University of Colorado at Boulder for 19 years. He was principal investigator of a number of research projects sponsored by the National Science Foundation and other federal and state agencies.

His areas of research include the development of hybrid testing and simulation methods, assessment of the seismic performance of concrete and masonry structures using nonlinear computational models and large-scale testing, and the development of improved design methods for these structures.