



DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

Recent Advances in Improving Resilience of Built Infrastructure through Hybrid Simulation/Testing Techniques

Professor David Lau

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Date: July 22, 2019 (Monday)

Time: 5:00 p.m. - 6:00 p.m.

Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

Abstract

The recent twin earthquakes M6.4 and M7.1 on July 4 and 5, 2019 near Ridgecrest in southern California, US once again remind us the risks of major earthquakes to society. Since the 1971 San Fernando earthquake in California, the development of the concept of ductile seismic design have resulted in significant improvement to the seismic performance of post 1980s designed structures. However, lessons from subsequent earthquakes demonstrate the need of improvement to the resilience of structures. The development of the new paradigm of performance-based seismic design of structures promotes innovations in earthquake resistant design of structures that go beyond code-based prescriptive design approach. Despite significant advances in the development of the performance-based design methodology and increasing acceptance by the design communities and industry, implementation of performance-based seismic design in actual design practice still encounters challenges. One of these challenges is the proper selection of the target performance objectives for the design structures and verification that the design structure meets the target performance objectives. In light of uncertainties and the need for verification of today's sophisticated numerical models and computer simulation techniques and the prohibitive costs of testing full scale prototype structural systems to meet these challenges, the new experimental method of hybrid simulation/testing technique has been developed in recent years.

This presentation will give an introduction of the new hybrid simulation/testing technique for testing large or full scale prototype structural systems. It combines the efficiency of computer simulation with the accuracy of physical testing of structural systems. Compared to conventional testing method that typically can only provide information on the response of structural components or sub-assemblies, hybrid simulation can give the total response of a complete structural system without the need of testing the entire structure. The presentation will discuss a number of recently completed hybrid simulation projects of high-rise RC shear-wall buildings, hybrid steel-timber high-rise buildings and long-span bridges. Current work in the new direction of extending the hybrid simulation technique to multi-hazard applications (earthquake, wind, fire and blast) that includes fire following earthquake and other multi-hazard combination scenarios will also be presented.

About the Speaker

Dr. David Lau is a Professor of Civil Engineering at Carleton University, Ottawa, Canada, and the Director of Ottawa-Carleton Multi-Hazard Research Centre (OCMHRC) and Ottawa-Carleton Bridge Research Institute (OCBRI). He obtained his B.Eng in Civil Engineering from McMaster University in Canada and M.Sc and PhD in Structural Engineering from the University of California at Berkeley. His research interests include earthquake engineering and structural dynamics, assessment and retrofit of existing structure and network of infrastructure and structural health monitoring. He is the chair or member of numerous Canadian and international design code committees on seismic design of structures.

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