

UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

Distinguished Lecture Series

Professor Amr S. Elnashai

University of Illinois at Urbana-Champaign

Integrated Seismic Assessment and Design of Plan-Irregular Structures

Friday, October 5, 2012

12:00 – 1:00 p.m. Seminar

Room L2D2, Engineering Lecture Hall, UH

Abstract

Plan-irregular structures suffer from torsional effects when subjected to earthquake ground motion. Statistics of damaged buildings from earthquake-stricken regions confirm the significance of torsional coupling of vibration modes. Damage is repeatedly observed even on seemingly plan-symmetric buildings that have been designed to modern seismic codes. The presentation, based on the recently-completed doctoral research of DoSoo Moon under the supervision of the presenter, identified a new type of asymmetry referred to as kinematic eccentricity, due to non-uniform distribution of inelastic demand on plan-symmetric structures.

Structures of varying complexity are studied, using a new method of calculating the instantaneous center of inelastic stiffness in dynamic analysis, when subjected to a carefully selected set of translational and rotational ground motion, and response trends are identified. It is demonstrated that the fixed eccentricity value used in design codes is inadequate and an alternative approach is proposed. The widely-used BIM software REVIT Structure (Autodesk) is modified to enable two-way communications with the Illinois advanced dynamic analysis program ZEUS-NL, to adjust structural and architectural elements in the BIM model to minimize torsional effects on RC buildings. The developed methodology and software addresses a significant problem by combining advanced inelastic dynamic analysis tools with commonly-used design office practices.

About the speaker:



Amr S. Elnashai is the Head of the Civil and Environmental Engineering Department, and is responsible for all academic and administrative affairs of the top-ranked department comprising 49 tenured and tenure-track faculty, 10 non-tenure track faculty, 47 staff, 1300 students, a research budget of \$20M, and a total budget of ~\$33M per year (FY13). Amr developed the College of Engineering Strategy for Global Engagement in 2008, and continues to report to the Dean of Engineering as Director and Chair of the Council on Global Engineering Initiatives. He is a Fellow of the United Kingdom Royal Academy of Engineering, and a Fellow of the American Society of Civil Engineers and the UK Institution of Structural Engineers.

He is founder and co-editor of the Journal of Earthquake Engineering and editorial board member of several other journals, a member of the drafting panel of the European design codes, past chair of the UK earthquake engineering association, UK delegate to and past senior Vice-President of the European Association of Earthquake Engineering. He is the winner of the Imperial College Unwin Prize for the best PhD thesis in Civil and Mechanical Engineering (1984), the Oscar Faber Medal for best paper in the Institution of Structural Engineering, and two best paper medals from the International Association of Tall Buildings, Los Angeles.

Amr's technical interests are multi-resolution distributed analytical simulations, network analysis, large-scale hybrid testing and field investigations of the response of complex networks and structures to earthquakes. He has published more than 250 research publications, including over 135 refereed journal papers, many conference, keynote and prestige lectures (including the Nathan Newmark Distinguished Lecture), research reports, 2 books and several book chapters, magazine articles and earthquake field investigation reports. Amr has successfully supervised 43 Doctoral and over 100 Master of Science theses. Many of his students hold significant positions in industry, academia and government in over 12 countries.