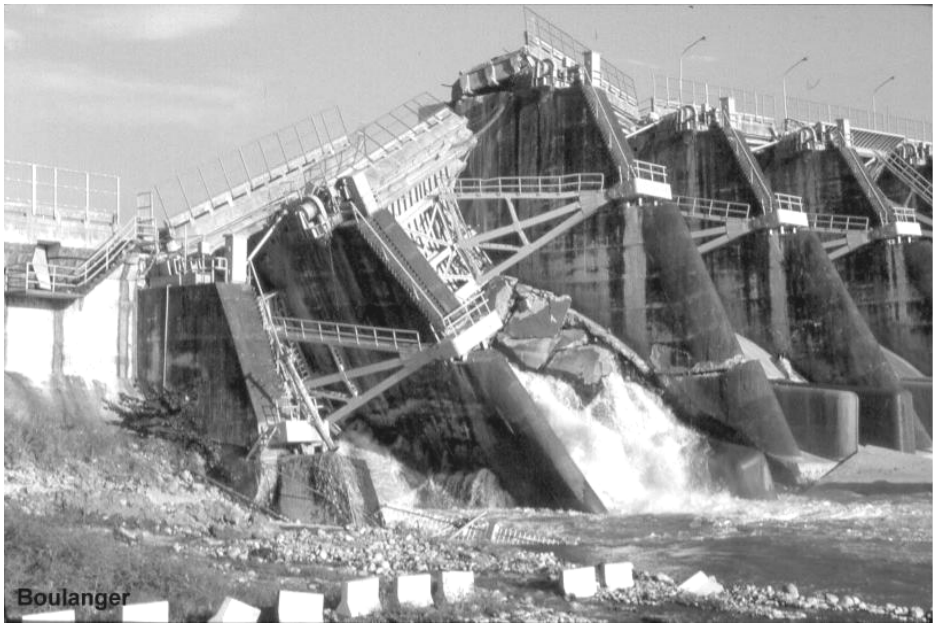
Seminar on
Structural Design for Seismic Resistance: Past, Present and Future



Speaker :

Assoc. Professor Dr. Rajesh Dhakal

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Venue:

Faculty of Engineering and Built Environment Meeting Room
Universiti Kebangsaan Malaysia, Bangi, Selangor

Thursday 12th November 2009
9.00 am – 11.30 am

Organised by

Department of Civil and Structural Engineering
Universiti Kebangsaan Malaysia, Bangi

SPEAKER

Assoc. Professor Dr. Rajesh Dhakal

Prof Rajesh Dhakal received a Bachelor degree in Civil Engineering from Tribhuvan University, Nepal in 1993, an ME from AIT, Thailand in 1997, and a PhD from the University of Tokyo, Japan in 2000. After working as a Research Fellow in NTU, Singapore, he joined the University of Canterbury, New Zealand in 2003. His teaching and research involvements are in the areas of structural/earthquake engineering. He has authored more than 120 technical papers in the areas of reinforced concrete, earthquake engineering, and structural fire engineering. He is the recipient of three best paper awards, three best academic performance awards, and two best researcher awards including the prestigious Ivan Skinner award and the Otto Glogau award. He is a member of several national and international professional organizations and has served as a reviewer for more than 10 international journals in Structural and Earthquake Engineering. Currently, he is an Associate Editor for the ASCE Journal of Structural Engineering, and an Editorial Board member of Civil Engineering Transactions of Scientia Iranica.

ABSTRACT

In the last century, seismic design has undergone significant advancements. Starting from the initial concept of designing structures to sustain no or minimal damage during an earthquake, the modern seismic design philosophy allows structures to respond to ground excitations in an inelastic manner, thereby allowing damage in earthquakes that are significantly less intense than the largest possible ground motion at the site of the structure. Current performance-based multi-objective seismic design methods aim to ensure life-safety by preventing collapse in large and rare earthquakes and to limit/avoid structural damage in frequent and moderate earthquakes. Lately, more emphasis is being given to financial implications of a seismic event rather than on measures of structural response and/or damage. This has led to the conceptual development of loss optimization seismic design; a probabilistic risk-based seismic design philosophy which looks likely to be the basis for future seismic design approaches. Expected annual loss (EAL) is an effective way of communicating seismic vulnerability of constructed facilities to the non-technical stakeholders, such as owners and decision makers. A probabilistic seismic risk assessment method is formulated in the form of a quadruple integral equation to estimate EAL. Probabilistic relationships between seismic intensity and structural response are obtained analytically. Structural response is then quantified in terms of different damage states, which correspond to different levels of losses. The losses due to all likely earthquake scenarios are integrated to estimate the expected annual loss (EAL). This loss estimation process can account for all three sources of loss; i.e. the damage repair cost, loss of income due to downtime, and human injury/fatality. It incorporates the randomness and uncertainty inherent in the parametric relationships used in the process. Examples are presented to illustrate the advantages of the seismic risk assessment method and its application in loss optimization seismic design.