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Roles of Large-Scale Structural Testing – As Lessons Learned from 1995 Kobe and 2011 Tohoku Earthquakes

By

Masayoshi Nakashima

Professor Emeritus, Disaster Prevention Research Institute (DPRI), Kyoto University, Japan
President, Kobori Research Complex (KRC) & Technical Counselor, Kajima Corporation, Japan

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Time: 3.00 pm to 4.00 pm
Venue: E3 #06-09
2 Engineering Drive 3,
Singapore 117583
Faculty of Engineering,
National University of Singapore

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Abstract

In 1995, Japan was hit by a devastating earthquake in the Kobe region. Scenes of collapses revealed that our cities were vulnerable with many existing stocks not constructed with the most recent design and construction techniques. Various efforts in the public and private sectors were implemented after the earthquake to upgrade our old infrastructures and buildings as well as to make our construction technologies more advanced for the assurance of stronger and more durable societies. A notable effort along this line was the construction and operation of a very large shaking table nicknamed E-Defense.

The presenter served as the inaugurating director of E-Defense and supervised over forty full-scale or largescale tests. A few representative tests are introduced, together with the backgrounds of those tests as well as with the difficulties associated with large-scale testing. Sixteen years have passed since 1995 Kobe; then Japan was severely hit again by a huge tsunami and earthquake named 1995 Tohoku earthquake. Thanks to the advancement of seismic design and construction, performance of buildings and infrastructural systems was generally satisfactory, but a huge rupture of faults generated an unprecedented tsunami disaster. The damage extended into a huge region also caused a new problem regarding the overall recovery of society. The word, resilience, has become a norm to overcome the Tohoku damage and to prepare for the future.

Among various efforts to this end, a national project that deals with quantification of "collapse margin" was conducted, in which the presenter served as the principal investigator. The project included collapse tests of a steel high-rise office building and a RC mid-rise apartment building. The tests also looked into the effectiveness of structural health monitoring in terms of the identification of damage location and severity. The outline and major results of the tests are summarized, and major findings are presented particularly in light of the importance of quantification of collapse

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margin before the earthquake and prompt assessment of damage immediately after the earthquake.

Speaker Biography

Masayoshi Nakashima is Professor Emeritus at Kyoto University, Japan. He earned his bachelor and master degrees from Kyoto University and Ph.D. from Lehigh University, the Unites States. After the doctoral study, he started working for the Building Research Institute (BRI) of Japan and then for Kobe University before joining Disaster Prevention Research Institute (DPRI), Kyoto University. His fields of research include seismic analysis and design of steel building structures and large-scale experimental techniques for the simulation of earthquake responses. Nakashima and his students have published about four hundred technical papers, nearly two hundred of them appearing in archived journals.

He earned various national and international awards, including the Best Paper Prize of AIJ (Architectural Institute of Japan), the Best Paper Prize of JSSC (Japanese Society for Steel Construction), the ASCE (American Society of Civil Engineers) Moisseiff Award (2000), the Special Achievement Award of AISC (American Institute for Steel Construction) (2009), the ASCE Ernest E. Howard Award (2013), and the EERI (Earthquake Engineering Research Institute) George W. Housner Medal (2014), among others. He is Member of the Engineering Academy of Japan and also inducted in 2015 to Foreign Member of the National Academy of Engineering (NAE) of the United States. Nakashima was President of AIJ until 2017 and is currently President of IAEE (International Association for Earthquake Engineering. He also serves Editor of EESD (International Journal of Earthquake Engineering and Structural Dynamics. In March 2017, he retired from Kyoto University and joined Kajima Corporation as a technical counselor and its affiliated research institution named Kobori Research Complex (KRC) as the president.

Contact Person: Professor Tan Kiang Hwee Tel: 6516 6827; Email: tankh@nus.edu.sg
General Enquiry: Ms Norela Buang Tel: 6516 4314, Email: nor@nus.edu.sg
*****Seats are limited. Please register early. All are welcome and admission is free*****

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