

You are cordially invited to the seminar organised by Protective Technology Research Centre (PTRC).

## **Seminar on**

# **Adoptions and Applications of New Technologies in Japan – Positive Collaboration between Design and Construction**

### **Abstract:**

In the construction of Japan, wood has been the primary material for centuries. It is also notable that Japan and Japanese traditionally show significant appreciation to “handcraft” and “manufacturing”. Another unique feature of Japan is such that Japan suffers seriously from various natural disasters including earthquakes; hence how to protect our houses and infrastructural systems against such disasters has been and will be the most critical societal need. With such historical background in mind, this seminar wishes to touch upon the following five issues, all of which are closely related to “how to ensure the quality of structures for safer and more comfortable life”.

First, the Japanese fondness of steel structures is discussed in light of the similarities between wood and steel. Wood has been used for centuries for both individual houses and large structures such as temples and shrines. Both wood and steel commonly adopt framing systems that consist of columns and beams, and how to connect these members is the key for the assurance of structural integration. Making the best use of the centuries’ experience on wood design and construction, Japan has been very eager to develop technologies associated with steel construction.

Second, Japanese loves detailing, which indeed characterises the architecture of Japanese buildings, houses, and other structures. Complicated roofing details, exquisitely crafted eaves, complex connections using interlocking, among others, have been appreciated particularly in temples and shrines. This spirit of “love for details” is inherited in the contemporary Japanese design and construction, and a few examples that demonstrate this spirit are introduced.

Third, Japanese eagerness to “new development” is worthy to note. It has been embedded in Japanese heart that handcraft and manufacturing and people engaged in them are the objects to respect. For this reason, new development, new invention, and sophisticated engineering are always the targets to challenge, and eventually many new products have been developed in Japan. A few examples along this line, particularly those related to steel structures, are cited, including high-toughness steel, high-strength steel, fire-resisting steel, ultra-high strength bolts, low-yield steel, buckling restrained braces, and concrete filled steel stubs. In not a few of those developments, however, the attitude of “technology driven” (relative to “business-driven”) makes the products over-qualified, whose tendency of Japan is often called “Galapagosization”.

Fourth, Japan and Japanese place emphasis on “positivism”, partially because of our love to “manufacturing”. Along the line of research and development in technological products, “experimentation” is valued significantly in Japan, and accordingly, many experimental facilities for structural testing have been developed and installed in both the public and private sectors. Two good examples are: the hybrid simulation in which the structural test and time-history simulation are run side by side to reproduce the structural response under earthquakes and the world largest shaking table named EDefense. Development of these facilities as well as interesting applications are briefly presented.

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Finally, Japan has a tradition of good collaboration between design and construction (manufacturing). In some countries, the relationship between design and construction is vertical, i.e., design is placed above construction in the order of chain as well as in the social recognition. Unlike those, Japan traditionally exercises equal partnership between design and construction, which has been believed to be the key for the ultimate quality control of construction products. Examples are given into the collaboration between design and construction in early stage of design and thorough efforts toward quality assurance during the construction.

### Speaker:

**Dr. Masayoshi NAKASHIMA** is currently the President of Kobori Research Complex Inc., Technical Counsellor of Kajima Corporation, Professor Emeritus of Kyoto University, and President of International Association for Earthquake Engineering (IAEE).

Dr. Nakashima earned his BS and MS from Kyoto University and Ph.D. from Lehigh University. After working for the Building Research Institute of Japan and Kobe University, he joined Disaster Prevention Research Institute, Kyoto University, in 1992.

His fields of research include seismic analysis and design of steel building structures and large-scale experimental techniques for the simulation of earthquake responses. He and his students have published about four hundred technical papers, out of which he earned various awards, including the ASCE Moisseiff Award, the Special Achievement Award of AISC, the ASCE Ernest E. Howard Award, and the EERI George W. Housner Medal, among others.

Dr. Nakashima served as Director of E-Defense (an institution equipped with the world largest shaking table), Director of EERI, Director of DPRI, Kyoto University, Program Director of Cabinet Office of Japan on Disaster Resilience Project, and President of the Architectural Institute of Japan (AIJ). He is currently President of International Association for Earthquake Engineering (IAEE) and Editor of International Journal of Earthquake Engineering and Structural Dynamics (EESD).

He was inducted to Foreign Member of National Academy of Engineering, USA (2015) and Corresponding Member of the Mexican Academy of Engineering (2016). He also holds the honorary positions that include Honorary Member of IAEE, Honorary Member of AIJ, Honorary Member of EERI, and Honorary Professorship of Tsinghua University, China, among others.

**Date:** 2 August 2019 (Friday)

**Time:** 2.00pm to 4.30pm

**Venue:** CEE Seminar Room A, Block N1, Level B1, N1-B1b-06

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