EARTHQUAKE AND TSUNAMI RESISTANCE OF PRECAST CONCRETE BUILDINGS

Minehiro Nishiyama

ABSTRACT

If appropriately designed and constructed, precast concrete buildings are as good as or even better than cast-in-situ reinforced concrete buildings in terms of seismic and tsunami resistance. Precast concrete wall buildings had only slight damage during the two devastating earthquakes in Kobe in 1995 and in eastern Japan in 2011. However, some precast concrete gymnasiums and fishmarkets lost precast roof panels because of earthquake shaking and tsunamis.

The lecture starts with Japan's current seismic design method, followed by the typical precast housing in Japan. Then, it introduces structural damage to precast concrete buildings during the Kobe earthquake in 1995 and the East Japan earthquake in 2011. The structural design code revisions of buildings are discussed. The tsunami caused devastating damage to buildings, raising our concern for designing reinforced concrete buildings against tsunamis. Some examples are shown.

Presenter

Minehiro Nishiyama is a professor at the Architecture and Architectural Engineering Department, Graduate School of Engineering, Kyoto University, Japan. He obtained Ph.D. for a thesis entitled "Seismic Response and Seismic Design of Prestressed Concrete Buildings" from Kyoto University. He received the 1992 Otto Glogau Award from the New Zealand National Society of Earthquake Engineering for a paper written based on his Ph.D. thesis.

He worked as the president of the Japan Prestressed Concrete Institute (2015-2017) and vice-president of the Japan Concrete Institute (2018-2020). He is currently the president of the Japan Concrete Institute (2022-2024). His research interest is in the field of seismic performance of reinforced and prestressed concrete buildings, fire resistance of concrete materials and buildings, and the development of high-performance materials and structural systems. In addition, the environmental issues of concrete are his most recent research topic, such as the application of geopolymer concrete to structural members and the design of floating concrete structures for wind power towers.

He, as a member of the reconnaissance teams dispatched by institutes and the Japanese government, has investigated many regions devastated by severe earthquakes such as the Northridge earthquake (USA) 1994, the Hyogo-ken Nanbu earthquake 1995, the Kocaeli earthquake (Turkey) 1999, Chi-Chi earthquake (Taiwan) 1999, the earthquake off the Pacific Coast of Tohoku 2011, the Kumamoto earthquake (Japan) 2016 and the Puebla earthquake (Mexico) 2017. Reports on the investigation results have been published in international journals.