Estimating Earthquake-Resistant Properties of Building Structures

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Keywords Earthquake resistant design (23010)

Research Topics

- Measurement of building structure vibration
- Earthquake resistant analysis of reinforced concrete structures
- Maximum response displacement of a building structure during its serviceable period

Research Seeds

The author's research field is earthquake resistant design of building structures. Main activities are the observation of strong motion, response analysis during earthquake, and measurement of micro-tremors. When the 2011 Off-the-Pacific coast of Tohoku Earthquake occurred on March 11, the earthquake and the ensuing tsunami killed many people. Moreover, damage to buildings from the earthquake was not noted and was soon forgotten because the damage caused by the tsunami was much greater and the nuclear power plant difficulties also became serious. By contrast, the 2016 Kumamoto earthquake caused great damage to structures and provided opportunities to reconsider the power and risks of earthquakes. Fig. 1 shows ground acceleration records for Sendai National College of Technology. Respective panels show the 20110311 (14:46) Off-the-Pacific coast of the Tohoku Earthquake (M9.0), the 20050816 (11:46) Off-the-Miyagi coast Earthquake (M7.2), the 20080614 (8:43) Iwate-Miyagi inland Earthquake (M7.2), and the 20110407 (23:32) Off-the-Miyagi coast Earthquake (M7.1). Based on these records, the author has analyzed the relation between the index of failure property and actual damage. Fig. 2 presents an example of index. The author has also measured micro-tremors in buildings for which strong motions were observed. By comparing earthquake motion and micro-tremor data, the author has estimated the deterioration of buildings. Fig. 3 shows the relation of natural period and the maximum amplitude of acceleration of motion. Characteristics of a building before and after a strong earthquake are shown. Research theme has properties of analysis rather than development. The author hopes to predict causality between power exerted by nature and building damage.

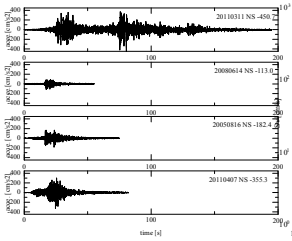

Fig. 1 Records of strong motions.

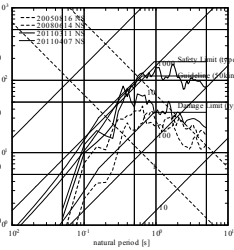

Fig. 2 Response spectrum.

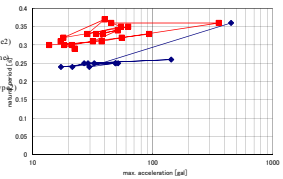

Fig. 3 Relation between natural period and amplitude.

Related Technology

- Engineering for natural disasters