

EARTHQUAKE PROTECTION

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Keywords: Earthquake damage, earthquake engineering, earthquake-resistant design, masonry, pilotis, fault, Pancake collapse

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Summary

Earthquake disaster is one of the most difficult to mitigate among natural disasters, because the earthquake prediction is not yet possible at present. We can survive if we go outside from the building which might be collapsed by the earthquake, when the earthquake prediction becomes possible. Most of death tolls by earthquakes are caused under the collapsed buildings and structures. Therefore, the only way to survive from a strong earthquake is to construct various structures so that they may not collapse due to the earthquake. It is very important to know how the structures collapsed in the past earthquakes, in order to construct such structures that do not collapse due to the strong earthquakes. As a result of examining many past earthquakes, many useful lessons can be learnt. Various earthquake-resistant methods of construction are considered based on those lessons, and they are outlined in this chapter and detailed in the related chapters..

1. Introduction

Earthquake engineering is the study of earthquake damage and how to keep it to a minimum. In particular, earthquake damage has various aspects; structures such as buildings and bridges suffer significant damage due to earthquakes. Establishing method of designing structures so that they may survive future earthquakes with little or no damage is our major goal.

Towards this objective trial and error method was used for long time. Now it is concluded that the shortest and the most effective way to attain the goal of earthquake-resistant structure is based on the following steps:

- 1) How the destruction of structures actually occurs during an earthquake must first be thoroughly investigated.
- 2) Next, a method of using the results of the above study must be devised and the worst case earthquake conditions must be suitably simulated.

3) Finally, the results obtained from the earthquake damage study are used to establish earthquake-resistant design aiming at preventing destruction or at least minimize damage.

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Biographical Sketch

M. Hakuno was born on January 24, 1932. He received B.S., M.S., and Ph.D. degrees, all in Civil Engineering in 1956, 1958 and 1961 respectively, all from University of Tokyo. He held the following positions Research Associate, Institute of Industrial Science, University of Tokyo, 1961-1962; Assistant Professor, Institute of Industrial Science, University of Tokyo, 1962-1965; Associate Professor, Tokyo Institute of Technology, 1965-1968; Associate Professor, Earthquake Research Institute, University of Tokyo, 1968-1979; Professor, Earthquake Research Institute, University of Tokyo, 1979-1992; Director General, Earthquake Research Institute, University of Tokyo, 1990-1992; Professor, Department of Civil Engineering, Tokyo University, 1992-2002; Dean, Faculty of Engineering, Tokyo University, 1995-2000. He became Professor Emeritus, University of Tokyo in 1992 and since 2002 is President, Kogyokusha College of Technology. He was Chairman, Engineering Seismology Section, Atomic Power Committee, MITI of Japan, 1990-1997; President, Japan Society for Natural Disaster Science, 1991-1994; and is President, Association for Earthquake Disaster Prevention, Japan, since 1998.

Prof. Hakuno conducted investigations on the and 17 earthquakes of 1964 in Niigata in Japan and the 16 earthquakes of 1970 in Peru. He was responsible for a plan for Strong Earthquake Alarm System 10 seconds before it attacks a city, 1972 and Proposal of a hybrid collapse test system on a structure, 1974. He conducted investigations on collapse process simulation of structures by Extended Distinct Element Method. He has many publications on important aspects of earthquake resistant design of structures.