公益財団法人　セコム科学技術振興財団
研究成果報告書

研究課題名

安全・安心のためのリアルタイム残余耐震性能判定装置の実用化と社会実装

Development of residual seismic capacity evaluation system for existing buildings and its practical implementation to enhance safety and rerief

研究期間

平成 26 年　4 月　～　平成 30 年　3 月

報告年月

平成 30 年　6 月

研究代表者

東京大学 地震研究所 災害科学系研究部門 教授

楠 浩一

Professor, Division of Disaster Mitigation Science, Earthquake Research Insitute,

The Univerisity of Tokyo

Koichi Kusunoki

Abstract

When a catastrophic strong earthquake occurs, a rapid residual seismic evaluation is important to avoid an another cajualties due to aftershocks, and to reduce the number of refugee who escape from houses that have enough residual seismic capacity. Japan has the quick inspection system, which has some defects. Since it depends on visual inspection of cracks in the vertical members, it took many days to investigate enough number of buildings, the results varied depends on the inspector's skill, and many gray results of "Limited entry" are made.

In order to overcome these degects, a new real-time residual seismic capacity evaluation system with inexpensive few accelerometers are developed in this project. The methodology is inspired by the new seismic calculation method, "Calculation of response and limit strength", which was added to Japanese building code system in 2000. The system was installed under this project to many school buildings, telecommunication towers, low-rise residential houses, and high-rise apartment buildings to confirm the validity of the system.

Since it is almost impossible to record responses up to collapse of a building within the project duration, the system was also installed to the specimens for shaking table tests. Large scale shaking table tests were chosen, which were conducted with "large scale shaking table" of NIED located in Tsukuba city of Ibaraki prefecture, and E-Defense, which is the largest shaking table in the world of NIED located in Miki city of Hyogo prefecture.

The evaluation result need to be indicated to the owner and users of the building at a proper timing by a proper way. It is also discussed under this project, and a proposed indication system was installed to an existing high-rise apartment building.

During a strong catastrophic earthquake, blackout may occur. It was found when the system was installed to an existing building that cabling is costly and time consuming. Wireless sensor with backup battery is expected. A feasibility study was conducted under this project.

If the system is useful not only after an earthquake but also for building maintenance, the system will be widely applied. A feasibility to use ambient vibration measurement for building maintenance was also conducted under this project.