

Development of technology to quickly evaluate the robustness of core facilities damaged by earthquake

(Study period: FY 2019–)

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1. Introduction

Government buildings often become the core base of disaster management to facilitate quick restoration from earthquake damage. In past earthquakes, it took too long for experts to check whether government buildings were robust enough for people to enter (Figure 1), which slowed down the restoration processes.

This study aims to present technical materials about structures and non-structural members of buildings that are necessary for building administrators to judge whether people can enter a building.



Figure 1: Robustness is unclear immediately after an earthquake

2. Contents of the study

This study aims to solve the following two points.

- The use of devices, such as accelerometers, is a possible option in quickly judging the robustness of a structure immediately after an earthquake without depending on experts. Yet, there are no common engineering evaluation criteria to use.
- Technical materials used in the visual inspection of the robustness of non-structural members immediately after an earthquake are not yet available.

The following studies are going to be implemented to overcome these issues.

- By analyzing the structure of a building model, engineering evaluation criteria for judging the robustness of the structure using an accelerometer (Figure 2) are presented. Technical precautions are also organized for practical application.
- A visual inspection guideline for non-structural members is prepared (including the evaluation of

damage to suspended ceiling materials [Figure 3]).

In (i), standards are going to be prepared for the robustness judgment of a structure by using acceleration sensors installed in a building to numerically capture the properties that go through rapid changes during an earthquake. Specifically, the robustness of a structure is estimated from the level of changes in the natural period of a structure during an earthquake. In (ii), the current situation of an earthquake damage evaluation of non-structural members is organized. Then, standards for robustness judgment are prepared after conducting experiments on the evaluation of damage in suspended ceilings where knowledge and insights are in short supply.

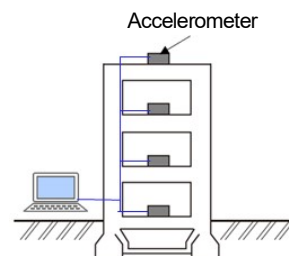


Figure 2: Practical application of the robustness judgment system in a building

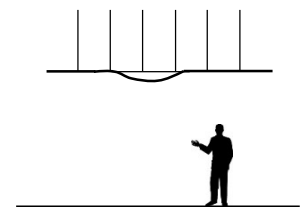


Figure 3: Damage to a suspended ceiling

3. Examinations in FY 2019

Regarding (i), the relationship between the remaining performance of an entire building estimated on the basis of damage to individual members during an earthquake and changes in the natural period are being examined by recreating seismic motion using simulations. Records of earthquakes are also being analyzed. Regarding (ii), current references about non-structural members clearly exhibiting damage from an earthquake are being gathered and organized.