

Analysis of Damage Patterns of Old Residential Retaining Walls

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TAKEYA Shuichi (Ph.D. in Engineering), Head, Urban Planning Department, Urban Disaster Mitigation Division

INOUE Namihiko (Ph.D. in Engineering), Urban Planning Department

ABE Kazuomi, Head, Building Department, Standards and Accreditation System Division

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1. Introduction

Plains in our country are limited, and as the population increases, housing sites requiring the construction of retaining walls have been developed in hilly areas, etc. (see Photo). However, a large number of cases old residential retaining walls have been damaged by earthquakes, and it is therefore an important issue to promote inspections and earthquake resistant measures. In response, we have begun to develop technologies for earthquake resistance of old housing site retaining walls from 2020. This paper presents the results of damage analysis according to the separation distance between housing site retaining walls and buildings as part of the current status of technological development.



Photo: Example of a housing site with retaining wall construction

2. Damage analysis according to the separation distance between the retaining wall of housing site and the building

(1) Residential retaining walls subject to analysis
The soundness of residential retaining walls is influenced mainly by factors indicated by the blue boxes in Fig. 1. Residential retaining walls that have lost their soundness due to aging or other reasons may suffer earthquake damage, which may cause damage to building foundation, etc. Therefore, we focused on the separation distance between retaining walls and buildings, and decided to analyze the effect of damage to retaining walls on buildings, targeting the residential retaining walls in Sendai City that were damaged by the Great East Japan Earthquake.

(2) Analysis results

AS a result of summarizing the degree of building damage according to the results of hazard assessment on damaged housing sites, which is conducted to mitigate and prevent secondary disasters in housing sites, the percentage of buildings totally destroyed was slightly under 46% for those with a risk rating of "large" (384 samples) and about 17% for those with the same risk rating of "Medium" (1,593 samples). Next, we tabulated the percentage of building damage

by separation distance between the residential retaining wall and the building for those housing sites with a risk rating of "large" or "medium" for which the separation distance from the building was known (1,500 samples), but could not obtain any clear trend. Therefore, the results were tabulated based on the cumulative number of building damages, and it was found that the composition ratio of total and major partial building damages together tended to be higher when the separation distance was 1.0 m or less (Fig. 2).

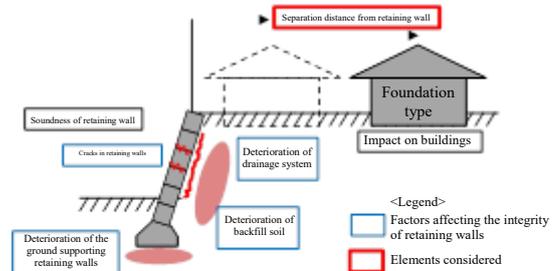


Fig. 1: Elements considered in this research

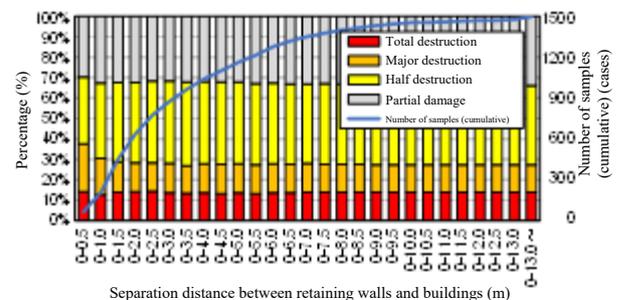


Fig. 2: Building damage by separation distance between retaining wall and building

3. Conclusion

We plan to continue to study the impact of damage to residential retaining walls on building damage so that results can be used as a criterion for identifying residential retaining walls that need to seismic retrofitting.

☞ See the following for details.

- 1) Outline of "Technical Development Contributing to Urban Regeneration and Resilience through Rationalization of Structural Regulations for Buildings and Ground"

http://www.nilim.go.jp/lab/hcg/kisojiban_hp/kisojiban.htm