

Way Sounding of Housing Reinforcement for Effective Reduction of Earthquake Fatalities -Demonstrations in Model Areas-

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1. Introduction

It is indispensable for reduction of earthquake casualties that the improvement in seismic performance of dwellings. There is no other solution for reducing earthquake casualties than improving the seismic performance of dwellings. Many local government offices are promoting the movement for reinforcement of dwellings, employing the Test using so-called Diagnostic Table for assessing seismic performance of wooden structure dominant in Japan. The score of this test expresses the result numerically from 0.01 to 2.25. The dwelling with the score more than 1.5 means safe without devastating damage even under 7 on JMA seismic intensity scale. The score lower than 1.5 means the necessity of reinforcing of a dwelling under consideration. However, to let all dwellings satisfy these rule is too hard in reality, because of cost and time 1). This study aims to reconsider these target scores so as to get much reality using 2 indexes of [acceptable damage level] and [estimated earthquake hazard]

2. Acceptable and Unacceptable Damage Levels and Estimated hazard.

We introduced 4 different strengthening statuses in intelligible terms for citizen starting from by Okada's study 2). Those are as follows.

Minimum level target: no death or heavy injury

Second level target: no serious hindrance of living

Third level target: no leakage by rain

Fourth level target: no trouble for daily life

Citizens can choose one out of the above 4 strengthening levels as occasion demands.

We demonstrated some calculations of 2 types of scenario earthquakes as follows.

The Ocean Earthquakes : Tokai earthquake, Tonankai earthquake, Coupled Tokai-Tonankai earthquake

The Inland Earthquakes : Atera fault, Atotsugawa fault, Sekigahara-Yoro fault, Sekigahara fault

For the ocean earthquakes which may suffer moderate damage we need high urgent preparation. The inland earthquakes make huge damages but not so imminent in Gifu prefecture.

3. Demonstrations in model areas

One of trials is to figure the number of dwellings which needs any reinforcement for each type of earthquake. There are about 780,000 wooden houses in Gifu prefecture. When we target the recommended score of 1.5 or higher, the total number of houses requiring any reinforcement comes up to about 730,000. In case of [no death or heavy injury], it is however as low as about 10,000 at the ocean earthquakes. We expect finishing reinforcement of under 1.5 score dwellings is very difficult before the ocean earthquake that give no time to prevention, in spite that too many houses need strengthening. However, if we target the most important problem in earthquake protection [no death or heavy injury], reinforcement needed dwellings reduce as low as 1.5% of the total number of existing houses in Gifu prefecture.

4. Conclusion

Recommended target as of 1.5 seems too far to popularize since we need high reinforcement cost and time very much. By introducing step-wise targets we propose here, we can get more freedom and availability according to individual situation. Local governments can get, with no loss of time, more freedom for preparedness planning in consideration of the most anticipating earthquake and associated damage features. We continue studying on what the reinforcement should be developed for reducing casualties through various trials.

References

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