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論 文 要 旨

THESIS SUMMARY

専攻： Department of	建築学	専攻	申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of	（Engineering）
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

In 2010, Japanese government issued a law to promote the utility of large-scale wooden structure in public facilities, such as schools, gyms and libraries. Such facilities are generally low-rise buildings with large inner space and require critical disaster prevention, for instance, fire and seismic scenario, which challenges the traditional wooden building techniques. In the past few decades, the utility of such large-scale wooden structure has been constrained compulsively by the building codes in many countries. Although the wooden structure has shown some good seismic performance on account of its light-weight, flexibility and ductility, those terms substantially restrict the building area size and structural stories, considering that the smaller the area, the lower risk of the fire.

Comfortingly, the situation now is changing with the development of new fireproofing and construction techniques. One alternative method to lift the inherent limitation of the wood is using the hybrid structure. Hybrid construction allows the designer to combine the best attributes of wood and other material to improve performance, economics and occupant satisfaction in a way that might not be possible using only one of the material and its associated construction techniques. In 2012, Architectural Institute of Japan (AIJ) presented a prototype of horizontal wood-concrete hybrid building in school construction to explore the feasible techniques and implementation of the large-scale wooden structure, also as a response to the issued law in 2010. Since the seismic activity in Japan is above the average, the seismic performance of the prototype is highly worthy of note. Take it as an opportunity, the seismic performance of such horizontal hybrid structure is then studied in this research.

The thesis is organized into six chapters as follows:

Chapter 1 introduces the background of the application of wooden hybrid structure and conducts relative literature review. The main objects of the study is highlighted and the scope of the studied structure is delineated.

Chapter 2 introduces the shaking table tests on three 1/3-scale specimen of wooden horizontal hybrid structure. In this chapter, a target-drift-based design process is proposed and the influence of the diaphragm stiffness is investigated as well as the influence of the shear wall configuration. In addition, the engineering interested parameters such as shaking mode, maximum displacement, story drift, peak acceleration and force distribution are also studied. From the test results, the basic characteristic of the wooden horizontal hybrid structure is reviewed.

Chapter 3 builds a 3D discrete numerical model in OpenSees. A modified subroutine material was proposed to simulate the wood shear wall and diaphragm. The accuracy of the numerical model was confirmed by the comparison between the analytical results and the shaking table tests in Chapter 2.

Chapter 4 extends the numerical model proposed in Chapter 3, by changing some concerned design features, such as the stiffness ratio between the core part and the wood part and the stiffness ratio between the diaphragm and the wood shear wall. A quantitative evaluation on the concerned design feature is provided. Some specified values for the design features were suggested and a simple method to evaluate the shear distribution between the diaphragm and the shear wall was proposed.

Chapter 5 proposes a simple design procedure for determining the concerned seismic shear force of the wooden horizontal hybrid structure in the preliminary linear design. The dual equivalent lateral force (DELF) method is presented that permits the extension of the equivalent lateral force (ELF) method by separating the hybrid structure into two independent substructures. The prediction of the DELF method is reasonable when compared with the result of modal response spectrum (MRS) method.

Chapter 6 presents the conclusions drawn from this study, the conclusions from each chapter are outlined.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).