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 RECENT RESEARCH ACTIVITIES

Structural Investigation for Development of CLT Construction Method
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1. Introduction

Toward establishment of sustainable society, the higher engineered technique for wooden buildings of low environmental impact has been attracted attention such as Cross-laminated timber (CLT), which can effectively utilize low-quality wood materials and enables to compose a reasonable wall structure. Due to progress of research on materials and construction methods, it has become possible to design those CLT buildings by general methods in recent years.



Figure 1. Two types of CLT construction methods.

Two types of structure systems have been developed for CLT building; its wall structure is composed by assembling of narrow size panels (Figure1, left) or by large size panels with openings (Figure1, right). The former enables to acquire a high ductility due to metal connectors, while the latter generally has high strength performance and easy construction characteristics.

2. Research Subjects

We have focused on the research of CLT building in terms of following subjects for example.

- 1) **Estimation of in-plane bending strength of CLT member** is trying to develop a simulation model for determining the allowable strength. The influence of defects such as knot and finger joint distributed on each layer and also the lamination effect which is a reinforcement due to cross laminate layer are taken into consideration in the model. This research aims to provide the proper estimation for the in-plane mechanical property of CLT which is important when used as vertical structural element such as shear wall.
- 2) **Clarifying the load carrying mechanism of shear wall CLT panel** conducts an analytical approach of FEM by focusing on the crash behavior at the bottom of the CLT wall panel due to stress concentration around the connector hole. The influence of vertical load which becomes significant when in the mid-rise building subjected to seismic load is the major point of interest. The digital image correlation method is also employed in order to obtain the stress distribution.
- 3) **Evaluation of in-plane shear property of CLT wall panel with opening** is studying the influences of stress concentration at the in-corner of opening. L and T shaped specimens with various size configurations were employed for the static tests, and the bending stress distribution of non-linear shape along the cross section was observed. Then the reduction factor of shear strength was calculated in combination with the effect of rolling shear property obtained by the test.

3. Future Plan

CLT construction system is progressing. Different type of metal connectors have been developed and need to be evaluated. Long-term phenomena or durability of CLT construction is also important subject of research. Besides, combination use of CLT with steel or reinforced concrete structure as composite structure system is also highly expected. Taking above into consideration, we are conducting research aimed at further expanding utilization of CLT.

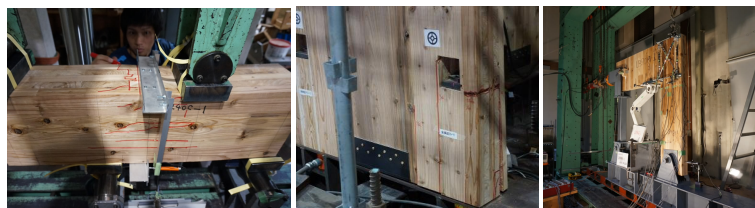


Figure 2. Experiment examples by research subjects (1)-(3)