ABSTRACTS (MASTER THESIS)

The structural performance of reinforced concrete flames with CLT infills

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Introduction

Recently, from the viewpoint that the wood use is promoted, using wooden structural materials to middle or high-rise buildings is expected in Japanese architectural field. But, it's difficult to design those buildings due to fire resistance. Therefore, the composite structure with wooden structural materials and steel or RC (Reinforced Concrete) structural materials is gathering attention. For example, floors and walls of steel or reinforced concrete structures are composed of wooden structural materials. And CLT (Cross Laminated Timber) can play a role as walls and floors because CLT is panel, has high rigidity and strength. So, in this research, to confirm the structural performance and reinforcement of composite structure with CLT wing walls and RC flames as shown in Figure 1 is aimed.

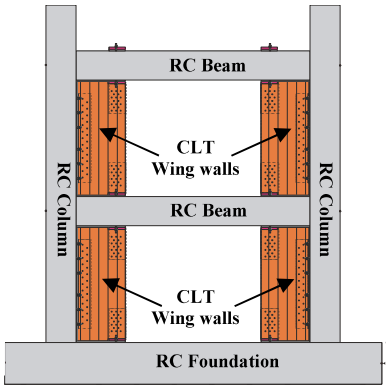

Figure 1. Composite structure with CLT wing walls and RC flames

Method

In this research, steel plate insertion type drift pin joint and slip stopper shown in Figure 2 are selected as the joints between CLT infills and RC flames. After that, flame test specimens shown in Figure 1 are designed. Flame test specimens are prepared 3 types. The parameters are presence of CLT wing walls and joint type. Type A specimen has CLT wing, and joint type is steel plate insertion type drift pin joint. Type B specimen has CLT wing walls, and joint type is slip stopper. Type C specimen has only RC flames. And flame test and material test are conducted, the examination about structural performance, reinforcement and the stress state of structural members is conducted.

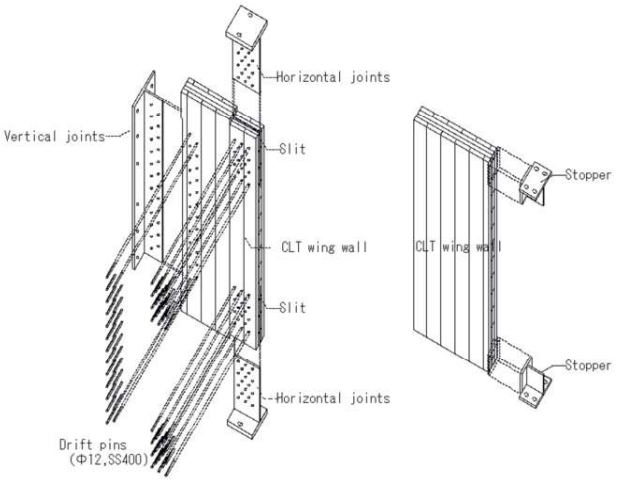

Figure 2. The specification of joint

Result and discussion

The skeleton curve of load-deformation angle is shown in Figure 3. Comparing between each specimen, maximum load of A specimen is 1.8 times higher than C specimen, and B specimen is 1.6 times higher than C specimen. In addition, Initial rigidity of A specimen is 1.8 times higher than C specimen, B specimen is 1.5 times higher than C specimen. From the above, reinforcement of RC flames is detected by filling CLT wing walls in RC flames.

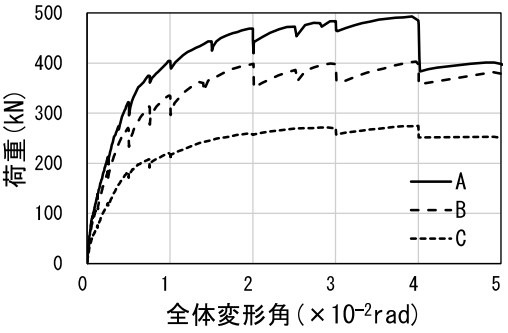

Figure 3. The skeleton curve of each