Development of earthquake resistance evaluation method for wooden houses using the information of three-dimensional CAD

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1. Introduction

Eighty-five percent of new detached buildings are constructed based on the framework construction method, and 90% of those buildings are constructed using precut materials (a method to quickly assemble a house using materials that are precut in a factory). Fully automated mechanical processing using three-dimensional CAD and CAM are the mainstream tools for precutting. Design data of frameworks and joints are needed to evaluate earthquake resistance of wooden houses. The above data are created as three-dimensional data in CAD data for precutting. The data are thus highly compatible with the computation of allowable stress and stress analysis. The three-dimensional CAD data prepared for hundreds of thousands of houses every year are now being kept idle in precutting factories without being used for earthquake resistance evaluations. Figure 1 shows a standard flow of design and production of wooden houses. In actual operations today, building confirmation is given in the design phase, followed by the precutting process where structures, such as frameworks, are examined for the first time. If this flow is changed so that the three-dimensional data created in the precutting process are used for structural designs, it will streamline the process and enable the production of wooden houses with higher safety against earthquakes. This study focuses on structural drawings of CAD for wooden houses and three-dimensional CAD data created in the precutting process and examined methods to link them with earthquake resistance evaluation.

2. Linking ***wallstat*** with CEDXM

The study selected CEDXM file format, a common format of CAD for wooden houses as the target of studying three-dimensional CAD data. The study linked the data with the structural analytical software called *wallstat* (Fig. 2) that Building Research Institute of National Institute for Land and Infrastructure Management (NILIM) developed. As a result, the team released the new version of *wallstat* linked to CAD in June 2015 on the Internet. This enabled users to create analytical models through simple operations from CEDXM files created using various CAD software and run earthquake response simulations.

3. Conclusion

The outcome of this study can be downloaded from the website of NILIM. Movies are also available on YouTube (Search “wallstat” on YouTube.). The program will be improved in the future by reflecting opinions of users and the development team.

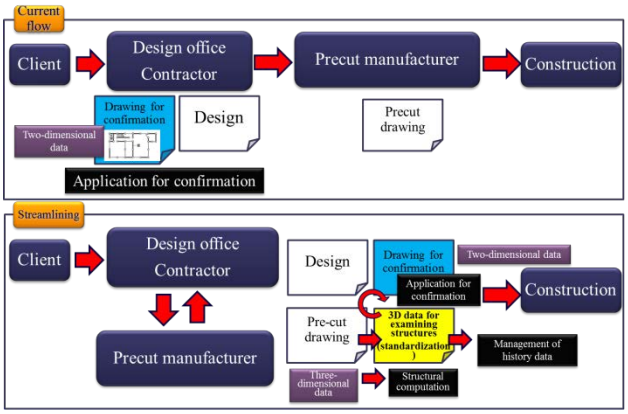

Figure 1 Production flow of a wooden house

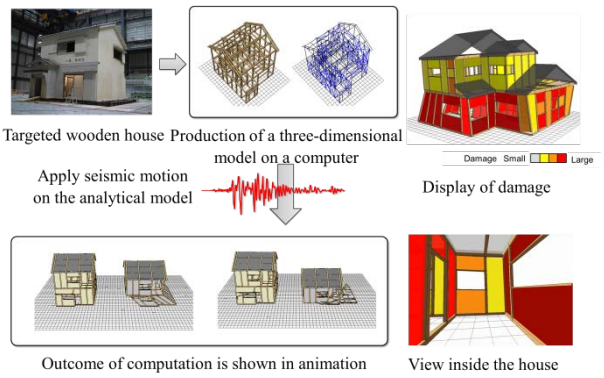

Figure 2. Overview of wallstat

☞For more information

1) Wooden house collapse analytical software, *wallstat*
http://www.nilim.go.jp/lab/idg/nakagawa/wallstat.html