Feasibility Study of Mass-Timber Cores for the UBC Brock Commons Tallwood Building

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Abstract

Recent progress in construction technologies has allowed establishing new records for mass-timber buildings, as for instance the height of the Brock Commons Tall Wood Building (TWB) of the University of British Columbia in Vancouver, Canada. TWB consists of a 53 meters tall timber-concrete hybrid structure; it has 17 stories of mass-timber superstructure erected on a concrete podium and is braced by two concrete cores that act as lateral force-resisting system against earthquake and wind loads. The objective of this work was to evaluate the possibility of designing the TWB using mass-timber cores. The feasibility of using cross-laminated timber or laminated veneer lumber cores was assessed by carrying out numerical analyses. The results included herein show that the seismic and wind performance criteria provided by the Canadian code can be satisfied only designing cores with continuous panels and rigid joints, and adopting a proper core layout.

Keywords: Hybrid structures; Modular construction; Prefabrication; Wood-based structures; CLT; LVL; Dynamic analyses; Seismic design; Wind design;

1 Introduction

New wood-based building systems and technologies are under development to meet today's demand for tall timber buildings [1,2]. In this process, hybrid wood-based solutions have been demonstrated as a rational way to design and push timber into the high-rise building market [3].

Canada recently showed the potential of hybrid systems by erecting the Brock Commons Tall Wood Building (TWB) [4] at the University of British Columbia Vancouver, which consisted of an 18-story and 53 meters' height structure made combining mass timber frame systems with two concrete cores. Floors were realized adopting cross-lamented timber (CLT) panels.

During completion of the TWB, the impact on the construction process of the concrete cores compared to the wood-based superstructure became evident. As a further improvement of tall wood buildings, hence it is natural to think that mass timber cores could be a rational way to reduce the construction time and on-site costs, as well as provide environmental benefits.

The objective of this work was to assess the feasibility of using mass-timber cores in place of concrete cores for the TWB. Results from a numerical simulation executed considering four

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