



Serviceability of New Generation Wood Buildings: Case Study of Two Cross-Laminated Timber (CLT) Buildings

<https://research.thinkwood.com/en/permalink/catalogue2644>

Author: Hu, Lin
Organization: FPInnovations
Year of Publication: 2013
Country of Publication: Canada
Format: Report
Material: CLT (Cross-Laminated Timber)
Application: Wood Building Systems
Floors
Walls
Topic: Serviceability
Acoustics and Vibration
Keywords: Ambient Vibration Tests
Vibration Performance
Sound Insulation
Language: English
Research Status: Complete

Summary:

FPInnovations launched the “Next Generation Building Systems” research program to support the expansion and diversification of wood into new markets. “Next Generation Wood Buildings” can be described as buildings that implement design and construction practices, and use innovative wood-based materials and systems beyond those defined and addressed in current building codes. As part of this program, the serviceability research focuses on addressing issues related to floor and building vibrations, sound transmission and creep.

CLT is a next generation wood building material, which is a promising alternative to concrete slabs. To facilitate wood expansion into the market traditionally dominated by steel and concrete, several CLT buildings have been designed or built. Taking this opportunity, we conducted this study on two CLT buildings in the province of Quebec (i.e., Desbiens and Chibougamau) to collect data that will form a database for the development of design provisions and installation guides for controlling vibrations and noise in CLT floors and buildings. The study also provides some information to designers and architects to strengthen their confidence in using CLT in their building projects. It is our hope that the collaboration through this study demonstrates to both designers and users of CLT buildings that if we work together, we can build good quality CLT buildings.

During the construction, ambient vibration tests were conducted on the two CLT buildings to determine their natural frequencies (periods) and damping ratios. Vibration performance tests were conducted on selected CLT floors to determine their frequencies and static deflections. ASTM standard sound insulation tests were conducted on the selected CLT walls and floors in Chibougamau CLT building to develop the sound insulation solutions. After the two CLT buildings were completed, ASTM sound insulation tests were conducted in the selected units to determine the Field Sound Transmission Class (FSTC) of the finished floors and walls, and the Field Impact Insulation Class (FIIIC) of the finished floors.

We found that in general, the vibration performance of these two CLT buildings and their floor vibration performance are functional. The efforts made by the design engineers, the architects, and the contractors to make it happen are commendable, considering the lack of design provisions and guidelines in building codes for controlling vibrations in such innovative wood floor and buildings. The sound insulation of the selected units in Chibougamau building was very satisfactory. This confirmed that with proper design, construction, and installation of the sound insulation solutions studied in this report, CLT floors, walls and buildings can achieve very good sound insulation.

Some specific recommendations for CLT building sound insulation:

- If flanking paths can be minimized, then it is expected that better sound insulation than what we measured on the CLT floors during the building construction will be achieved ;
- Increasing the stud spacing from 400mm to 600mm for the wood stud walls enhances the airborne sound insulation of the current wood stud-CLT wall assemblies tested in this study ;
- Decoupling ceiling from the structure frame and from the CLT floors is a significant factor for cost-effective sound insulation solutions ;
- Selection of solutions for FSTC and FIIIC above fifty (50) for non-carpeted CLT floors will ensure the satisfaction of the majority of occupants ;
- Conducting subjective evaluation is useful to ensure occupants satisfaction ;
- For implementation of the sound insulation solutions for floating floors, it is necessary to consult wood flooring and ceramic tiles installation guides for floating the flooring.

Online Access: Free

Resource Link

<https://library.fpinnovations.ca/en/permalink/fpipub39700> 

