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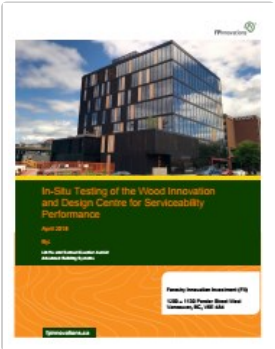

In-situ testing of the wood innovation and design centre for serviceability performance

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Date:	April 2018
Material Type:	Research report
Physical Description:	48 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Advanced Wood Materials
Subject:	Testing
	Performance
	Wood
	Buildings
Language:	English

Abstract:

Three performance attributes of a building for serviceability performance are 1) vibration of the whole building structure, 2) vibration of the floor system, typically in regards to motions in a localized area within the entire floor plate, and 3) sound insulation performance of the wall and floor assemblies. Serviceability performance of a building is important as it affects the comfort of its occupants and the functionality of sensitive equipment as well. Many physical factors influence these performances. Designers use various parameters to account for them in their designs and different criteria to manage these performances.
The overall objectives of this stud were threefold:
1. The vibration performance tests were to experimentally determine the dynamic properties, e.g., natural frequencies (periods) and damping ratios of the WIDC building through ambient vibration testing on:
o the bare structure in 2014,
o the finished building upon completion of the construction with occupants in 2015, and
o the finished building after 3 years of service in 2017.
2. The floor vibration tests were to evaluate vibration performance of the innovative CLT floor based on the bare floor fundamental natural frequency, 1 kN static deflection, and subjective evaluation.
3. The sound transmission tests were to determine the Apparent Sound Transmision Class (ASTC) and Apparent Impact Insulation Class (AIIC) of selected innovative CLT floor assemblies.
ASTM and ISO standard test methods were used for the floor vibration and sound insulation performance tests. The verified FPInnovations' protocol was used for building vibration performance tests.
In-situ tests carried out on the Wood Innovation and Design Centre have provided solid data on the serviceability performances of taller mass timber buildings, for both before and after completion. These data could be referenced by architects and engineers to help them in their designs and modelling to control building vibrations, floor vibrations and sound insulation performance. More specifically, the floor vibration performance was found to be satisfactory, and the sound transmission ratings were found to be above the minimum required level specified by the building code.
As observed from the tests on sound insulation performance, it is recommended to avoid small cavities in floor or wall assemblies to improve and optimize the acoustical performance. Based on the feedbacks and our experience of building vibration performance, it also recommended to refine the design tool, such as the building dynamic analysis model, using the measured frequencies so to improve the accuracy of the estimated building frequencies.

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