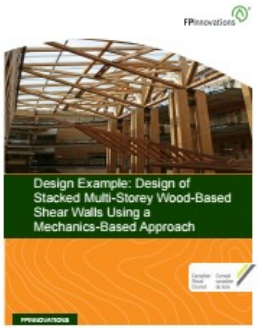

Design example : design of stacked multi-storey wood-based shear walls using a mechanics-based approach

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Author:	Newfield, G. Ni, Chun Wang, Jasmine
Contributor:	Canadian Wood Council
Date:	October 2013
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Field:	Sustainable Construction
Research Area:	Building Systems
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Language:	English

Documents

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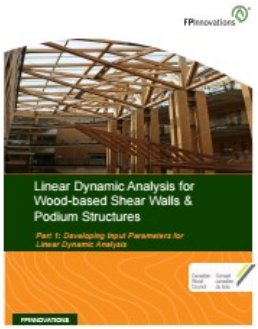
Linear dynamic analysis for wood-based shear walls & podium structures : Part 1 : Developing input parameters



for linear dynamic analysis

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Contributor:	Canadian Wood Council
Date:	October 2013
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Field:	Sustainable Construction
Research Area:	Building Systems
Subject:	Building construction Residential construction Design Moisture content Walls
Series Number:	W-3082
Language:	English

Abstract: Utilizing Linear Dynamic Analysis (LDA) for designing steel and concrete structures has been common practice over the last 25 years. Once preliminary member sizes have been determined for either steel or concrete, building a model for LDA is generally easy as the member sizes and appropriate stiffness can be easily input into any analysis program. However, performing an LDA for a conventional wood-frame structure has been, until recently, essentially non-existent in practice. The biggest challenge is that the stiffness properties required to perform an LDA for a wood-based system are not as easily determined as they are for concrete or steel structures. This is mostly due to the complexities associated with determining the initial parameters required to perform the analysis.

With the height limit for combustible construction limited to four stories under the National Building Code of Canada, it was uncommon for designers to perform detailed analysis to determine the stiffness of shear walls, distribution of forces, deflections, and inter-storey drifts. It was only in rare situations where one may have opted to check building deflections. With the recent change in allowable building heights for combustible buildings from four to six storeys under an amendment to the 2006 BC Building Code, it has become even more important that designers consider more sophisticated methods for the analysis and design of wood-based shear walls. As height limits increase, engineers should also be more concerned with the assumptions made in determining the relative stiffness of walls, distribution of forces, deflections, and inter-storey drifts to ensure that a building is properly detailed to meet the minimum Code objectives.

Although the use of LDA has not been common practice, the more rigorous analysis, as demonstrated in the APEGBC bulletin on 5- and 6-storey wood-frame residential building projects (APEGBC 2011), could be considered the next step which allows one to perform an LDA. This fact sheet provides a method to assist designers who may want to consider an LDA for analyzing wood-frame structures. It is important to note that while LDA may provide useful information as well as streamline the design of wood-frame structures, it most often will not be necessary. However, designers may consider using LDA for the following reasons:

Consider the effect of higher mode participation on force distributions and deflections.

Better determine building deflections and floor drifts.

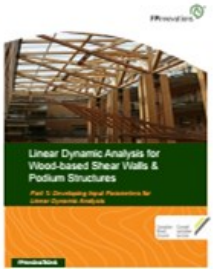
Allow for three-dimensional modelling.

Reduce the minimum Code torsional effect required under the equivalent static design.

Better consider the effect of podium structures (vertical changes in RdRo).

Compare the stiffness of various shear wall systems where mixed systems are used.

Documents



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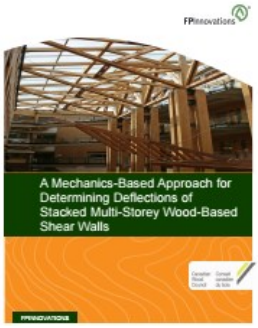

A mechanics-based approach for determining deflections of stacked multi-storey wood-based shear walls

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Author:	Newfield, G. Ni, Chun Wang, Jasmine
Contributor:	Canadian Wood Council
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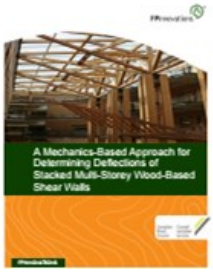
Field:	Sustainable Construction
Research Area:	Building Systems
Subject:	Building construction Residential construction Design Moisture content Walls
Series Number:	W-3083
Language:	English
Abstract:	The 2009 edition of CSA Standard O86, Engineering Design in Wood (CSA 2009), provides an equation for determining the deflection of shear walls. It is important to note that this equation only works for a single-storey shear wall with load applied at the top of the wall. While the equation captures the shear and flexural deformations of the shear wall, it does not account for moment at the top of the wall and the cumulative effect due to rotation at the bottom of the wall, which would be expected in a multi-storey structure. In this fact sheet, a mechanics-based method for calculating deflection of a multi-storey wood-based shear wall is presented.

Documents



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