Review and Survey on Differential Movement in Wood Frame Construction

https://research.thinkwood.com/en/permalink/catalogue2627

Author:	Wang, J.
	Ni, Chun
Organization:	FPInnovations
Year of Publication:	2010
Country of Publication:	Canada
Format:	Report
Material:	Light Frame (Lumber+Panels)
Application:	Wood Building Systems
Topic:	Design and Systems
Keywords:	Deformation
	Mid-Rise
	Shrinkage
	Movement
Language:	English
Research Status:	Complete

Summary:

This report summarizes the existing knowledge on building movement related to wood-frame construction. This knowledge includes fundamental causes and characteristics of wood shrinkage, instantaneous and time-dependent deformations under load, major wood-based materials used for construction and their shrinkage characteristics, movement amounts in publications based on limited field measurement, and movement estimations by construction practitioners based on their experience with wood-frame construction. Movement analysis and calculations were also demonstrated by focusing on wood shrinkage based on common engineering design assumptions, using six-storey platform buildings as examples. The report then provides engineering solutions for key building locations where differential movement could occur, based on the literature review as well as a small-scale survey of the construction industry.

The report emphasizes the importance of comprehensive analysis during design and construction to accommodate differential movement. Most building materials move when subjected to loading or when environmental conditions change. It is always good practice to detail buildings so that they can accommodate a certain range of movement, whether due to structural loading, moisture or temperature changes. For wood-frame buildings, movement can be reduced by specifying materials with lower shrinkage rates, such as engineered wood products and drier lumber. However, this may add considerable costs to building projects, especially when specifications have to be met through customized orders. Producing lumber with a lower moisture content adds significant costs, given the additional energy consumption, lumber degrade and sorting requirements during kiln drying. Specifying materials with lower moisture content at time of delivery to job site does not guarantee that wood will not get wet during construction, and excessive shrinkage could still be caused by excessively long time of exposure to rain during construction. On the other hand, effective drying can occur during the period between lumber delivery and lumber closed into building assemblies. Appropriate measures should be taken to ensure lumber protection against wetting, protected panel fabrication on site, good construction sequence to facilitate air drying, and supplementary heating before closing in to improve wood drying.

This report also provides recommendations for future work, including field measurement of movement and construction sequencing optimization, in order to provide better information for the design and construction of wood buildings, five- and six-storey platform frame buildings in particular.

Online Access: Free

Resource Link

https://library.fpinnovations.ca/en/permalink/fpipub39274