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Comparative result between standard requirements and finite element analysis of wood-frame panels

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Abstract

This study uses finite element analysis to compare the performance of load-bearing wooden-frame panels in terms of connection displacements caused by lateral loads resulting from soft-body impacts and wall's parallel load resulting from suspended objects. The panels were designed based on the project concepts of the Design for Sustainability and the Design for Reuse. Connections play an important role in the design of the panels as they support and transmit loads to contiguous panels without collapsing. We designed two panels and connected them using an aluminum alloy (H-shaped cross-section, 2.0-mm thickness). An instantaneous impact energy load was replaced by an instantaneous equivalent load. Afterwards, the simulation was repeated for long-term loading during 24-h to verify the creep effect. The results obtained showed that all the simulations performed herein meet the standard prerequisites and the wall thickness could be less than used in this analysis. Yet, for constructive facilities and thermal and acoustic behavior, the thickness remained unaltered to improve these properties, regarding other studies previously developed.

Keywords: Sustainability. FEA. Wood-frame. Connectors. Creep.

1. Introduction

Nowadays, numerous nations worldwide struggle to find viable alternatives to materials used in construction and aim to generate products that perform better in terms of energy and sustainability [1]. Wood and its products, which are renewable resources and provide a better energy performance than the other materials typically used in construction, offer a viable choice.

The design for excellence (DfX) methodology is widely used by several industries around the world, and, it is used extensively in integrated product development (IPD). However, in emerging countries, sustainable design and production processes in civil construction are still incipient.

The recent dismantling of institutional programs for low-income families combined with manufacturers' disinterest results in the construction of expensive buildings, which are typically purchased and traded for investment. Such factors lead to a housing scarcity for low- and middle-

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