DISPUTATION

MANAGEMENT OF ACOUSTICS IN LIGHTWEIGHT STRUCTURES

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Abstract

Lightweight buildings and in particular wood buildings have a lot of potential to grow in numbers. Wood is a renewable material useful in a number of different manners. It is a human friendly material and additionally it can reduce the environmental impact from the building industry considerably.

Acoustics in building structures might have negative impact on the residents, if not favoured with their right importance and properly addressed to meet expectations. For lightweight structures like wood, if the design and the management of the projects fail, the impact is often more severe and the implications for the tenants are different compared to those in buildings with heavy structures. This thesis gives an overview of the work done by the author over the last 25 years. It started by adapting regulations to fit the new building technique in 1994, when the building regulations allowed multi storey buildings with wood, after lifting the one-hundred-year old ban of multi storey wood buildings in Sweden. It follows by a description of the complicated process to assimilate new findings into provisions. Results and knowledge are collected and available from several research projects over the last fifteen years but still not introduced in any country but Sweden. In spite of clear research outcomes, results stay unused and the time prior to include changes into the building codes is very long (if ever). Therefore, one major finding from this work is that the design of wood buildings needs specific considerations in the building process and the development of helpful tools must continue to facilitate design of wood buildings. In addition, measured data for comparisons when modelling acoustics in buildings must become available for engineers to facilitate safe predictions and develop engineering calculation models. The developers of residential buildings must be aware of:

1. Which descriptors are applicable for sound insulation in the range of provisions?
2. Which target value should apply?
3. How to predict the sound insulation?
4. Risk for acoustic failure during erection of the building.

A safe design process is important for new housing developers or they will not take "risk" to use new materials and products, like wood, for multi storey residential buildings. This thesis discusses the challenges and opportunities for the wood industry in terms of acoustics in the building process. Specifically, the thesis concludes that designing a wood structure requires specific considerations at an early stage. It is also stated that knowledge far beyond specifications and standardised methods as referred to in mandatory documents are necessary. Finally, acoustics is one of the main design parameters for residential buildings, and therefore it should have raised priority during the entire building process.

Key words

Acoustics, Building acoustics, Sound insulation, Impact sound, subjective perception, prediction model, model verification, building process

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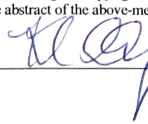
Signature  Date 2018-04-09