Master's Dissertation at the Div. of Structural Mechanics

VIBRATIONS IN A 7-STOREY WOOD BUILDING

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Background
In 1994 a change of the Swedish Construction Code, BKR, made it possible to design and construct buildings with more than two storeys made of wood. A part of the new urban district Välle Broar in Växjö is the quarter Limnologen where four houses are being built with the foundation and the ground floor made of concrete and the upper seven storeys with wooden frames. This makes them the highest buildings made of wood in Sweden.

One of the houses in Limnologen Quarter

There are many advantages of using wood as a construction material; it is flexible, ecological, economical, fire-resistant and it is strong compared to its weight. When using wooden frames special care has to be taken in order to meet the demands of sound and vibration isolation which can be problem with light weighted joists.

Wood is an orthotropic material, i.e it has three planes of material symmetry. This means that the material behaves differently when loaded in different directions; parallel to the fibers (longitudinal), radially and tangentially transverse to the fibers.

Content
The objective of the thesis is to investigate how vibrations (flexural waves) caused by steps will be transmitted in the building. The work will contain two parts. One is carrying out measurements with the help of a standardized tapping machine simulating steps and accelerometers measuring the accelerations. Several different cases are investigated: The transmission of vibrations between floor and wall, floor and ceiling and between different floors.

The second part is to develop a FE-model of the structure to simulate the dynamic effects of the steps. The software Abaqus 6.7 will be used for the simulations. The measurements will act as reference to see if the model is accurate. The goal is to verify if a very simple model of a building can predict how vibrations are transmitted.

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