MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

DEPARTMENT OF CONSTRUCTION SCIENCES | FACULTY OF ENGINEERING LTH | LUND UNIVERSITY

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PRESENTATION

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REPORT

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THE WORK IS PERFORMED AT

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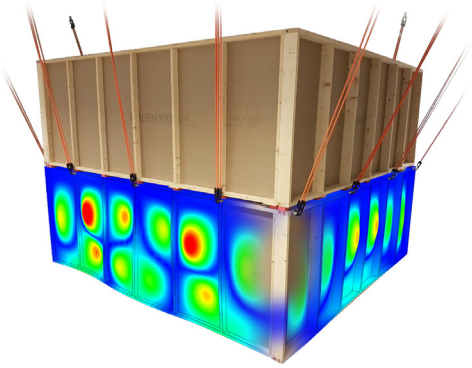
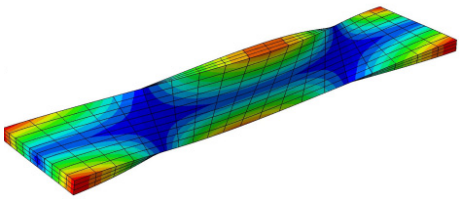
UTILIZATION OF DIFFERENT WOOD MATERIALS IN CROSS-LAMINATED TIMBER ELEMENTS





BACKGROUND

The increased adoption of cross-laminated timber (CLT) in structural engineering presents a sustainable solution for urban development. CLT is dynamically sensitive and susceptible to complications regarding comfort and structural stability. Traditionally, softwood has been used in timber construction, due to higher availability and economical reasons. Hardwood has different properties than softwood and previous studies have shown promising results when hardwood is incorporated. A proposed solution to mitigate the dynamical challenges is to introduce hardwood lamellae in CLT-panels and investigate different configurations, to find the most optimal design

AIM

The main objective is to investigate the feasibility of different CLT hardwood-softwood configurations with regards to vibrational and acoustic response pertaining to human comfort in the built environment. This entails determining the optimum configurations by investigating different arrangements of the hardwood lamellas. The hardwoods of interest are primarily beech and birch.

In order to achieve the main objective, the following subgoals are defined.

- Develop suitable computational models and perform calibration with a lab experiment.
- Determine the influence of hardwood lamellas by considering several different arrangements in CLT-panels.
- Perform frequency response studies and modal analyses.
- Evaluate the human comfort level of these optimums.
- Investigate structural response at corresponding configurations.

METHOD

The commercial software Abaqus will be used for finite element analyses. Furthermore, an experiment will be performed to validate the computational models. Various CLT configurations will be constructed, and steady-state analysis will be performed. The different CLT-panels are simulated by defining hardwood material parameters in specific arrangements. Furthermore, frequency-sweep analyses are performed in order to establish several relevant frequency response functions.

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