

NUMERICAL ANALYSIS OF MOISTURE TRANSPORT IN CLT

Jan Tippner, Barbora Vojáčková, Richard Slávik, Pavlína Suchomelová

ABSTRACT

Structural components made from wood and natural fibres are popular due to their favourable mechanical and physical properties, as well as their environmental benefits across the life cycle. However, the use of wood-based structural elements introduces risks, particularly related to increased moisture content and coupled mechanical loading.

The COMET Module project i3Sense aims to develop integrated sensing systems for monitoring key parameters such as moisture content, mechanical strain, and temperature within wood-based composites and structures. One of the project's tasks is the optimisation of the sensor placement in relation to the distribution of physical fields.

To support optimisation, a physical analysis based on numerical simulation of moisture transport is being conducted. The modelling approach differentiates moisture behaviour beneath and above the fibre saturation point by utilising diffusion and permeability coefficients. Finite element models are implemented in the COMSOL Multiphysics software.

Keywords: finite element method, moisture diffusion, free water movement, CLT panels.