MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

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

LATERAL STABILIZATION OF CROSS LAMINATED TIMBER BUILDINGS
Modelling approaches

LINA HOLMQVIST
lina.holmqvist.050@student.lu.se

SANNA KÄLLMAN GLEISNER
sanna.gleisner.0587@student.lu.se

PRESENTATION
APRIL 2022

REPORT
Will be published as
Report TVSM-5257

SUPERVISOR
Professor ERIK SERRANO
Div. of Structural Mechanics, LTH

ASSISTANT SUPERVISOR
Professor JOSE M. CABRERO
University of Navarra

EXAMINER
Dr HENRIK DANIELSSON
Div. of Structural Mechanics, LTH

THE WORK IS PERFORMED AT
DIVISION OF STRUCTURAL MECHANICS, LTH

IN COOPERATION WITH
UNIVERSITY OF NAVARRA, PAMPLONA, SPAIN

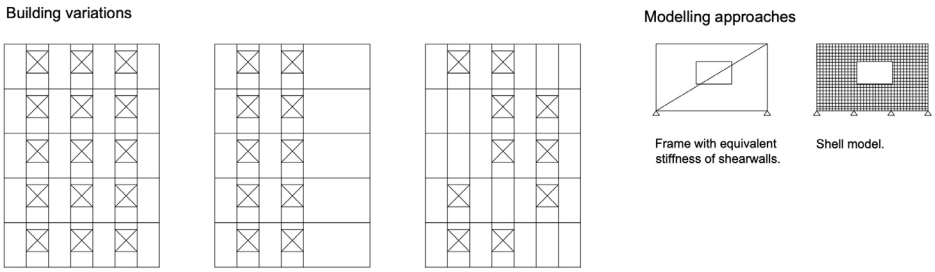

Figure 1 – Proposed building variations and modelling approaches

BACKGROUND

There is a need for more sustainable materials within todays building industry. Life cycle analysis of structures have concluded that using timber as the main material in the load bearing structure, will improve the effects on the environment. The concept of CLT, Cross Laminated Timber, was introduced in the early 90's. CLT is a product that is environmental positive, renewable and has a long service life.

CLT is an engineered product consisting of wood layers, where each layer is formed by timber boards. Every other layer is glued with the boards being oriented at a 90-degree angle relative adjacent layers. A CLT element is typically constructed with 3-11 layers, always an odd number of layers. The CLT element is a great substitute to other materials and products thanks to its high strength and stiffness properties. The material has a high load-bearing capacity compared to its weight and is therefore of good use in high rise buildings. The opportunity to construct CLT in many different shapes and sizes makes it a material with a great range of use.

RESEARCH QUESTIONS

- What type of modelling approaches can be used in design of CLT buildings for lateral loading, in this case wind loads?
- What is the effect of modelling choice on design of CLT buildings experiencing lateral loads?
- How does the placement and the ratio of openings affect the stiffness of a CLT building?
- How does the organization of different CLT panels (doors and windows) in a building affect its lateral stiffness? Which configuration of CLT sections is the most favorable regards to stiffness?
- What are the effects on the anchorage force and deformation?

METHOD

Several modelling approaches from literature will be studied, in simple FE-models (one wall section), see figure 1. Generic multi-storey buildings will then be used as cases to investigate the various modelling approaches. The different cases can include, e.g., a simple and symmetric/regular structure and asymmetric/irregular structures. The studying of the different modelling approaches can be done by comparing the results in terms of stiffness (deformation) and force distributions, possibly including e.g., anchorage forces.

DIVISION OF STRUCTURAL MECHANICS
Faculty of Engineering LTH, Lund University, Box 118, SE-221 00 Lund, Sweden
• Tel: + 46 (0)46-222 73 70 • Fax: + 46 (0)46-222 44 20 • www.byggmek.lth.se

xpTVSM-5257 (2021-11)