CROSS LAMINATED TIMBER ELEMENTS WITH IRREGULAR GEOMETRIES AT OUT-OF-PLANE LOADING CONDITIONS

CHRISTOPHER HAST
vov15cha@student.lu.se

DANIEL FATEMI
bas14dfa@student.lu.se

PRESENTATION
MAY 2020

REPORT
Will be published as
Report TVSM-5245

SUPERVISOR
Dr **HENRIK DANIELSSON**
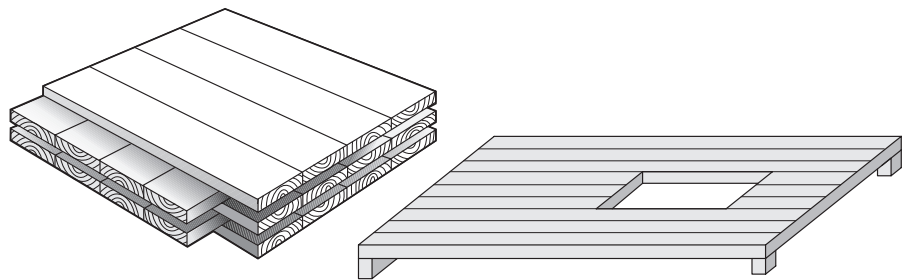*Div. of Structural Mechanics, LTH*

EXAMINER
Professor **ERIK SERRANO**
Div. of Structural Mechanics, LTH

THE WORK IS PERFORMED AT

DIVISION OF STRUCTURAL MECHANICS, LTH

BACKGROUND

The use of cross laminated timber elements in building construction is an expanding practice in both Sweden as well as internationally. The use of such elements is associated with various benefits. It is an environmentally friendly alternative to concrete and steel thanks to its low carbon footprint. In regions where timber is readily available, cross laminated timber elements can also be an economical option. Prefabrication of elements in a factory setting coupled with easy assembling at the construction site constitutes a logistically viable construction process. However, since the use of the material is rather new there is a lack of knowledge and experience in designing cross laminated timber elements. This is further exemplified by the fact that no Eurocode regulations for cross laminated timber are available at present, although such regulations are under development. It is against this background it is seen as relevant to contribute to the research concerning cross laminated timber element design.

THESIS OBJECTIVE

The main objective in this project is to investigate different calculation methods concerning irregular geometries of cross laminated timber elements. The main focus will be set on developing calculation approaches which can be used to evaluate cross laminated timber elements with irregular geometries that are loaded in the out-of-plane direction. The goal with this project is to investigate how stresses and deformations in cross laminated timber plates are affected by the presence of irregular geometries, such as holes. The results will constitute the basis for creating guidelines for the industry that can be used when designing cross laminated timber elements in the specific loading condition.

METHODOLOGY

The main methodology consists of conducting a parametric analysis using computer modelling and simplified analytical methods. Different kinds of models with varying degrees of detail will be used. The computer modelling will be carried out using the finite element method. To perform the modelling the software Abaqus CAE will be used. The results from the different methods of analysis will give the answer to what parameters are important to consider. The information regarding the effects of these parameters will be used to create the aforementioned guidelines.