

DESCRIPTION FOR THE GENERAL PUBLIC

The project deals with the analysis of static behavior of selected carpentry joints in wooden historical buildings. This knowledge is essential to analyze the entire structural system, and therefore for taking proper conservation decisions related to their repair, reinforcement or replacement with minimal intervention in the historic substance.

Tests that were carried out so far and studies described in the literature relate to some selected types of joints and are still incomplete. The current state of art in the subject of carpentry joints includes knowledge that is disordered and random, concerning only some selected connections types and their selected characteristics. The quantity and quality of research on the most important and one of the most common joints of historical rafter roofs: joint in the shape of dovetail between rafter and collar beam, are insufficient. In addition, there are practically no tests of typical connections in bending, e.g. joint in the shape of “bolt of lightning”. The aim of this project is to at least partially fill this gap and to develop this subject.

The main tasks of the project is to estimate the load carrying capacity and stiffness of the examined joints studied and propose best methods to repair and strengthen. In addition, attempts to determine the main locations of stress concentration, to determine the role of wooden dowels (or different connectors) in load transfer, to determine deformations under load and to determine patterns of failure mechanism in these joints will be taken.

The project assumes that the experimental tests of actual models and numerical analysis using finite element method will be conducted. Research will include both joints in bending elements (different forms of connection, i. a. the joint in the form of so-called “bolt of lightning” commonly used e.g. in Polish and Italian Renaissance objects) and joints under tension (the main joint of traditional timber structures between rafter and collar beam in the form of dovetail). The research will also use i. a. the photo-elasticity testing method that allows to visualize the distribution of deformations (stains) in the examined joints under applied load.

The proposed research is to give more detailed information about the static behavior of the analyzed joints. This will allow to design and introduce some appropriate reinforcements and to obtain the required load carrying capacity and stiffness of the joints. This in turn will result in the possibility of preventing or aborting of global deformation processes in historical buildings and monuments and will enable to select proper methods for conservation of the construction that is approvable from the point of conservation doctrine.