

Timber carpentry connections: influence of geometry, metal connectors and moisture content

Vulnerability of Timber Components: Ductility of Timber Connections; Moisture Induced Stresses

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Abstract

The structural safety assessment of ancient timber structures requires the evaluation of the mechanical properties of their elements and connections. As Building Codes focus mainly in common modern industrialized connections, they provide little guidance to designers regarding traditional timber carpentry joints. Therefore it is necessary to establish reliable behaviour models and detailing rules for the widespread traditional structural timber connections, concerning the influence of factors like geometry, metal connectors, moisture content, degradation and others.

The ongoing experimental campaign involves ramp load and cyclical tests of traditional front notched joints subjected to eleven different test conditions. The campaign aims to enclose the most frequently observed joint situations and provide more data about the behaviour and detailing of these connections. The parameters under evaluation are: notch depth, presence of interior mortise and tenon, influence of metal stirrups and binding strips, and influence of moisture content. Connections made with wood from ancient roof trusses attacked by furniture beetle will also be tested, in order to assess the influence of this common biological damage in the overall joint response.

Since some of these carpentry joints do not employ metal connectors, their integrity depends on internal axial compression forces that keep facing elements in contact. This aspect made the testing apparatus more complex, but special equipment was designed to allow a quick set up and testing of these connections.

In the proposed presentation we plan to present the ramp load and cyclical tests results and analyze the influence of the abovementioned variables.