

Jesus Gil

Promoter: Bjarne Husted, Lund University

Performance of joints for glued laminated timber exposed to the ISO fire temperature curve

As society becomes more ecologically conscious there is a push toward the use of materials with a smaller environmental burden, one of these materials is glulam (GLT), which has gained a lot of traction in recent years not only for ecological reasons but for its ease in manufacture, transport, noise dampening, etc.

The focus of this project was to evaluate the influence of different joint configurations on the fire performance of glulam members. To accomplish this 4 different samples were made each with variations in the type of fastener, plates, or protection used; these were fitted with a jack system to simulate the forces that glulam members experience during their use, and were afterwards exposed to 30 minutes of the ISO834 fire curve.

During the time of exposure, the size of the gap was measured as well as the temperature in certain relevant areas of the samples. For the unprotected samples tested the temperatures on the exposed side rose above 800 °C meaning a reduction of more than 90% of their yielding strength by the end of the test. In the case of the protected sample this meant only a 4.39% loss.

Additionally the affected areas were studied to determine the charring rate and burning patterns generated by the specific joint used, for the first joint this charred rate was 1.3 ± 0.1 mm/min, on the second joint 1.16 ± 0.07 mm/min, and 1.23 ± 0.13 mm/min for the third. Finally, the protected joint did not have a measurable amount of charr on the joint itself. In some cases, these charring rates went above from what was expected using the Eurocodes safety factor for joint charring, which was a value of 1.14 mm/min or close to 14 % less than the one obtained in test 1.

The experiments showed the susceptibility of the unprotected joints under high temperatures, significant differences in the behavior depending on the configuration, and the efficacy of fire protection over the mechanical attributes of joints.