GLULAM REBORN:

A FLEXIBLE ADHESIVE INTERFACE TO INCREASE THE BENDING RESISTANCE OF GLULAM

Dr. Maurice Brunner, Professor
Marc Donzé, Senior Researcher
Architecture, Wood and Civil Engineering
Bern University of Applied Sciences
Biel, Switzerland
maurice.brunner@bfh.ch

Abstract

Glulam is one of the most ingenious inventions the timber construction industry has yet seen. Defective boards can be sorted out. The selected boards can be graded and properly dried before being glued together. Glulam beams have much less scattering in their properties than solid timber beams and the technique is an efficient and effective way to achieve beams of great size and strength. Curiously, since the German carpenter Hetzer invented glulam a hundred years ago, there have been no real additions to the basic components. The grading techniques have been refined and the adhesives are constantly getting better, but otherwise there has been no basic change: Boards are still being glued together with stiff adhesives.

The authors propose a small but dramatic change to glulam: A single, flexible adhesive interface placed at a vantage position on the tensile face of the rectangular cross-section. They develop calculation models based on the well-known, so-called "Gamma-Method" to show that with this single move, the bending strength of a glulam beam could be increased by nearly 20%. Further calculations are developed to show the load-bearing behaviour that the special adhesive interface would need to possess. A comparison of the calculation results with the test results of an adhesive company helps the latter to develop the necessary adhesive interface. The paper will discuss the complex mathematics and present the test results of the adhesive manufacturer with the special adhesive interface.

In the next project phase, Glulam beams will be manufactured with the special adhesive interface and tested in bending.

Glulam may be in the process of being reborn.

Keywords: Glulam, flexible adhesive interface, 20% strength increase