

BEECH GLULAM: INCREASED YIELD OF RAW MATERIAL AND HIGHER STRENGTHS

Problem – Challenge

In Central Europe hardwoods are native to the non-alpine regions and will again displace the spruce. This process is favoured by the efforts to return from spruce monocultures to natural mixed forests and by climate change. Hardwood, and beech in particular, has a higher strength than spruce, which is used in the majority of timber constructions. Despite this advantage, glulam made of hardwood is rarely used, partly because of the higher unit price. Therefore, beech is known to most people only as good firewood. In order to change this situation, Fagus Suisse SA, together with researchers from the Bern University of Applied Sciences BFH, have developed beech glue double laminated timber.

Solution

With the innovation of double laminated beech wood, beams with a bending strength of over 60 megapascals (MPa) will be possible. For comparison: glue laminated timber (glulam) made of spruce currently available on the market has a strength of 24 to 32 MPa, and with the currently known processes, a strength of 48 MPa is achieved for hardwood glulam. This envisaged increase in strength from 25 to 150% to 60 MPa creates new market opportunities for wood from Swiss forests. Because the length of the raw material is limited, boards have to be finger jointed in a glulam beam. In contrast to normal glulam,

these joints are controlled and staggered in high-strength double laminated beams. This reduces the negative influence of the joints on the strength to a minimum and higher strength can be guaranteed. A great advantage of glulam is the so-called lamination effect, which leads to a homogenisation of the properties and at the same time limits the size of individual wood characteristics. In the case of double laminated glulam, this effect is even exploited in two directions. In addition, this double lamination causes the required raw material to have a smaller cross-section. This results in a greater yield with higher strengths. The gluing of the double laminated timber is done by means of a high-frequency press. This technology makes it possible to reduce the pressing time from hours to minutes. The process has not yet been used for gluing beech wood for load-bearing elements. Within the framework of the research project, various adhesives were evaluated by means of a parameter study and the parameters for standard-compliant bonding were defined. Wood is a natural product whose properties vary greatly, this also applies to the strength and stiffness (modulus of elasticity). It is therefore important to grade the wood and to know the influence of the wood characteristics on the strength. Within the framework of the project, the necessary parameters were worked out that allow the economic partner to sort the raw material according to strength classes, taking into account the yield.



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Parallel to the research work at BFH, Fagus Suisse SA has set up the production plant in Les Breuleux in the Jura.