hardwood_joint

Project objectives
Foster high-performance hardwood structures by developing economic, reliable and innovative joint technologies for hardwood members and the design thereof.

Tasks
(1) Joints with staples and nails
(2) Joints with axially loaded screws
(3) Joints with laterally loaded fasteners
(4) Joints with shallow grooves
(5) Modelling of joints

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hardwood_joint – innovative joints in hardwoods

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Partners:

Innovative joints in hardwoods

(4) Joints with shallow grooves

Friction in the shear planes is an important contribution to the load-carrying capacity of joints with laterally loaded fasteners. A promising way to increase stiffness and capacity of joints is therefore to increase friction by generating rough shear planes. Using modern CNC machines, this can be rather easily done as shown in Figure 1, where various hardwood products with shallow grooves on their surfaces are shown.

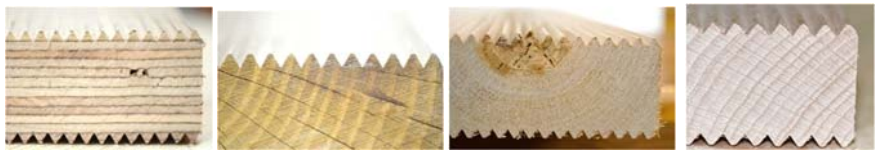

Figure 1: Shallow grooves on the surface of hardwood specimens.

To show the potential of modified timber member surfaces, the specimens shown in Figure 1 were then used to assemble joints, where both middle and outer timber members had grooves on their surface, and four screws were used to hold the members in place, see Figure 2. The exemplary load-displacement curve shown in Figure 2 shows that joints with grooves, the blue curve, can reach higher capacities than similar joints without grooves, the black curve. The failure mode of joints with grooves is rather brittle, with a sudden load drop at less than 1 mm displacement caused by shear failure of the grooves. The four screws needed for securing the position of the members have an additional benefit as they avoid a sudden complete failure of the joint, where the capacity of the joint with grooves drops to the level of the joint without grooves. For design of such joints, changes in moisture content need to be considered, as these impact on the effectiveness of the interlocking of the grooves.

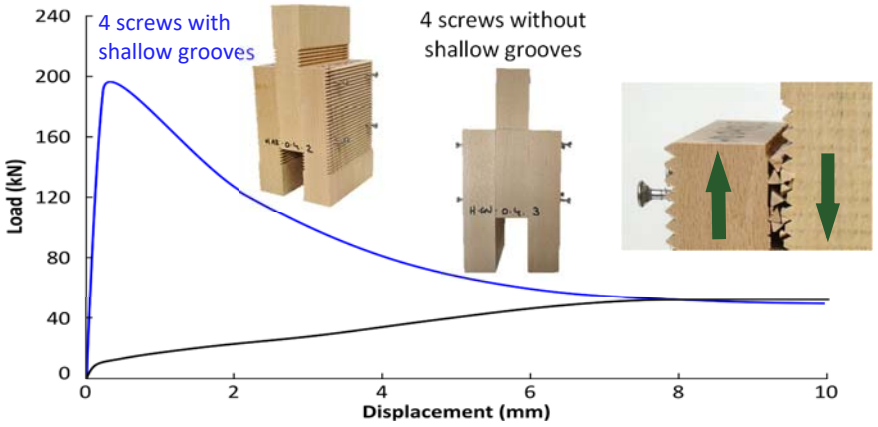

Figure 2: Load-displacement curves of two exemplary joint tests with beech; blue with shallow grooves in the shear planes, black without. Shear failure of grooves can be seen.