Wood construction under cold climate - Part one: Impact of cold temperatures on the shear strength of different adhesives glued wood joints of Norway spruce and Scots pine

As wood constructions increasingly use engineered wood products worldwide, concerns arise about the integrity of the wood and adhesives system. The glueline stability is a crucial issue for engineered wood application, especially under cold climate. In this study, Norway spruce (Picea abies) and Scots pine (Pinus sylvestris) joints (150mm x 20mm x 10mm) were bonded with seven commercially available resins (PUR, PVAc, EPI, MF, MUF1, PRF and MUF2) and tested at six temperatures (20, -20, -30, -40, -50 and -60 °C), respectively. Generally, for both species, temperature changes significantly affected shear strength of wood joints. As temperature decreased, the shear strength decreased. PUR resin resulted in the strongest shear strength at all temperatures tested. MF resin responded to temperature changes in a similar ways as the PUR resin. The shear strength of wood joints with EPI resins was sensitive to temperature change. MUF, PRF and PVAc resins demonstrated different characters with Norway spruce and Scot pine. At room temperature, all types of adhesive showed relative stability, in terms of shear strength variation. While at low temperature, the shear strength varied considerably. More specimens need to be tested in further work to more completely present the issue. The EN 301 and EN 302 may need to be specified based on wood species.

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