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'A contribution to the characteristic shear strength of a CLT wall under shear'

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Abstract:

Cross laminated timber plates (CLT) are planar timber elements and used e.g. for wall elements in constructional timber engineering. Little investigations can be found in load transmission behaviour for shear loads in plane ([Bosl, 2002], [Jeitler, 2004], [Wallner, 2004] and [5. GraHFT'06, 2006]). Until now the mechanical behaviour in respect to stiffness and ultimate limit loads of a single CLT element is not known sufficiently. The shear forces between two adjacent timber boards are transmitted by local torsional moments in each glue interface in order to obtain the equilibrium in shear stresses (duality of shear stresses) [Görlacher, Blaß, 2002] and induce the so called rolling shear stresses. By contrast a homogeneous CLT-plate, laterally glued together with the adjacent board, which implies full shear force transmission at the lateral sides thereby [Görlacher, Blaß, 2002], is able to carry the resulting shear stresses in each single layer.

Various test configurations, which should be used for experimental determination of shear-stiffness and shear strength of a single CLT plate, shall be presented in this paper. Among these test configurations the test configurations, established by members of the Bundeswehr University, Munich [Bosl, 2002], and another one, which was developed at the Institut for Timber Engineering and Wood Technology of the Graz University of Technology (TUG) and the holz.bau. forschungs gmbh, Graz (hbf) are presented and differencies of both test configurations and load introduction are further discussed.

Whereas a good accordance between theoretical and experimental values for the shear stiffness values can be found, it is not possible to determine the characteristic shear strength neither with the test configuration of Bundeswehr University, Munich nor with that one of Graz University of Technology/holz.bau forschung, Graz. Reasons can predominantly be found in local failures near the load introduction zones. These failures are mostly between timber boards and the surrounding steel frame or in the outer timber boards. Thereby test configurations do not supply a shear strength. At least a lower limit for a shear stress can be assigned, which can definitely be carried by the CLT-plate under shear. Furthermore two reasons are presented, why a characteristic shear strength is possibly not a constant value but depends on the chosen geometry of the CLT wall structure.