MASS TIMBER INSTITUTE

UNIVERSITY OF TORONTO
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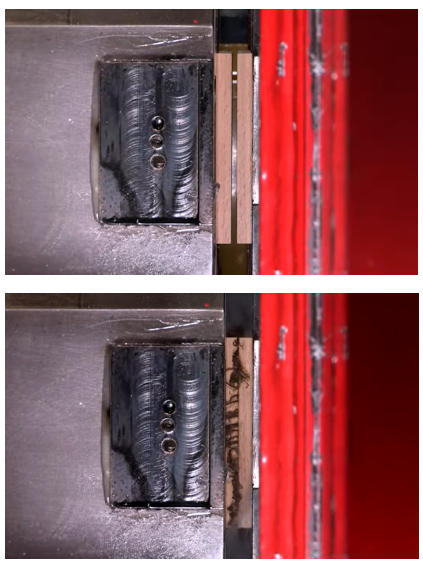
ADHESIVE FREE WOOD JOINING

An overview of developments in adhesive free joining techniques with mass timber products.

BuildingInWood Bulletin #7

Linear Friction Welding

TWI Ltd. and the University of Cambridge are further developing a technique called linear friction welding, where wood is joined without the use of any adhesives. Studies of linear friction welding of wood date back as early as 2000 and early tests were conducted when B. Stamm et al. joined 11 x 5 x 1cm blocks of Norway Spruce and Beech in 2005 [7]. More recently, the technique was investigated by TWI Ltd. and Cambridge University with a variety of hardwoods, softwoods and engineered woods like MDF, to evaluate the potential for scaling up and creating CLT [8]. Joining was acheived by rubbing the timber surfaces together at a high frequency (50-150 Hz), heating the lignin in the wood so that it re-sets [8]. The process took 2-3 seconds [8]. It remains to be seen whether this method can be implemented at the appropriate scale needed for construction.



Wood joining by linear friction welding. Image Credit: TWI Ltd.

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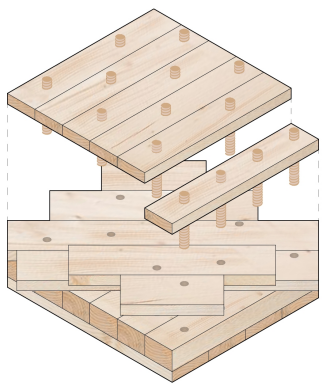
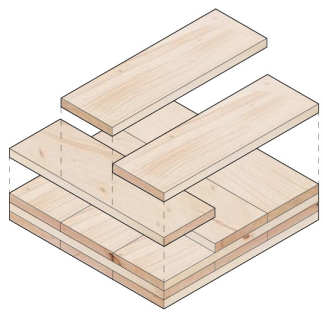
NUR-HOLZ CLT

NUR-HOLZ CLT is created without the use of adhesives. Instead, a blind hole is drilled into connecting layers which are then threaded by solid wood screws. The screws swell by absorbing moisture from the surrounding wooden planks and stay in place [3].



Nur-Holz CLT



CLT

Another atypical feature of NUR-HOLZ CLT is the orientation of the wooden layers. Some layers are laminated at 45 degrees instead of perpendicular to one another as typically seen in CLT. This lends the panels extra stiffness [3]. Finished wall, ceiling and roof panels are produced in sizes up to 2.9m x 8.6m [3].

Julius Natterer from the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland started experimenting with joining techniques starting by using nails [3]. This eventually evolved to joining using beech dowels (as described above) that swell to create a sturdy, friction fit joint building the NUR-HOLZ panel.

The NURHOLZ system claims to be more environmentally friendly with the additional benefit of creating panels with more complex shapes [3].

References and Further Reading

1. Stamm, B., Natterer, J., & Navi, P. (2005). Joining wood by friction welding. Holz als Roh- und Werkstoff, 63, 313-320.

2. University of Cambridge. (2021, May 17). Developing wood welding as a rapid timber joining technique. https://www.cdbb.cam.ac.uk/news/developing-wood-welding-rapid-timber-joining-technique

3. Bright Forest Limited. (2019). The Environmental and Efficiency Benefits of the NUR-HOLZ Method of solid Timber Construction. https://secure.broadland.gov.uk/MVM.DMS/Planning%20Application/741000/741077/20190352%20Method%20of%20Construction%20received%2007032019.pdf

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