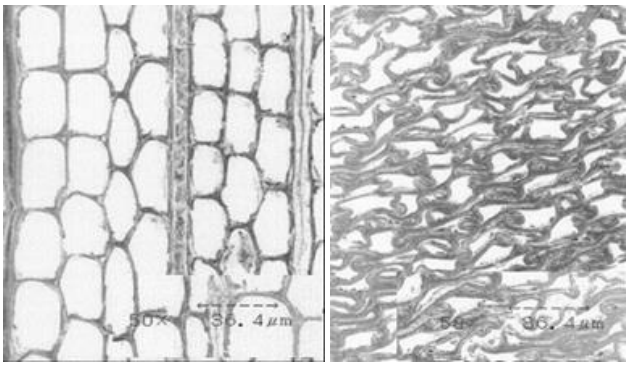
Interreg North-West Europe
Adhesive-Free Timber Buildings
European Regional Development Fund

Technical Note 2 – **Timber Compression**

One of a series of short briefings on timber technology produced by the towards Adhesive-Free Timber Buildings (AFTB) research project. The project is co-funded by Interreg NWE, 2016-2020. In this note, the process of densifying wood is explained.

Western Hemlock vertical grain timber sections before and after compression from 400 kg/m^3 to 1400 kg/m^3. Image by University of Liverpool.



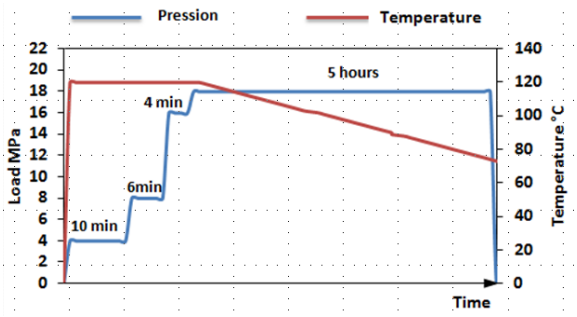
Electron microscopy images of timber cell structure before (left) and after (right) compression adapted from Asako et al.

By utilising high pressure and temperature, sustainable, fast-growing, softwood timber can be transformed into a material with greater strength, hardness and stiffness than even the most valuable tropical hardwoods.

A hydraulic press is used for the process with either heated platens or heating integrated into the tool. Stacking of tools as shown below allows higher throughput. In order to achieve densification of Scots Pine to 1400 *kg/m^3* for example, the pressure required was 16MPa at a temperature of 130°C, maintained for several hours, before cooling to below 80°C under load.

The increased temperature plasticises polymers in the wood matrix, allowing compression without significant damage. To minimise that damage the timber is best compressed in the radial axis, with growth rings perpendicular to pressing direction.

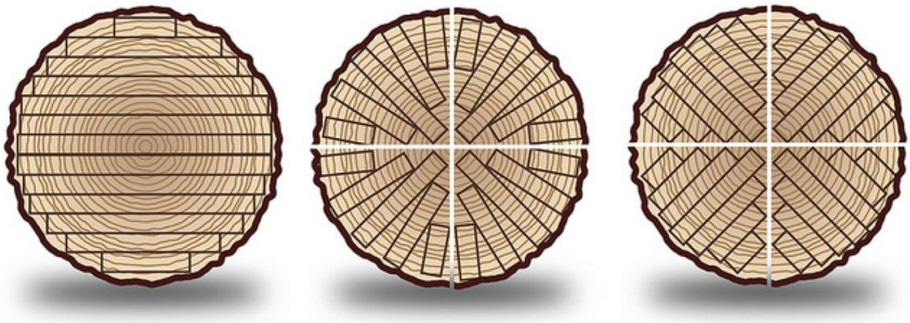
Rift sawn or quarter sawn timber is well suited, but flat sawn timber may be used if only appropriate sections are chosen.



Typical pressure/temperature variation during compression cycle provided by the University of Lorraine.

Forming of parts can either be done in the same step, by compressing blanking into a mould, or after by milling. Care must be taken when machining compressed timber, however, as its brittleness is increased.

Following compression the timber must be treated (physically or chemically) or stored in a desiccated environment. This is to prevent absorption of moisture which causes a 'spring-back' towards the original shape.



Above, left to right: flat sawn; rift sawn; quarter sawn timber. Image by OHC (www.OHC.net). Right: 19MN hydraulic press with stacked heated tooling, owned by Dehonit, Germany, capable of producing ca 15m^2 of compressed wood per cycle. Image by TUD Dresden

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Stakeholders Welcome

A key aim of the project is to engage with businesses, regulators and other interested parties. Adhesive-free timber building technology could be of interest to your business. Please get in touch via the e-mail addresses below:

For more information please visit the Adhesive Free Timber Buildings (AFTB) project website http://www.nweurope.eu/AFTB or use the contacts.

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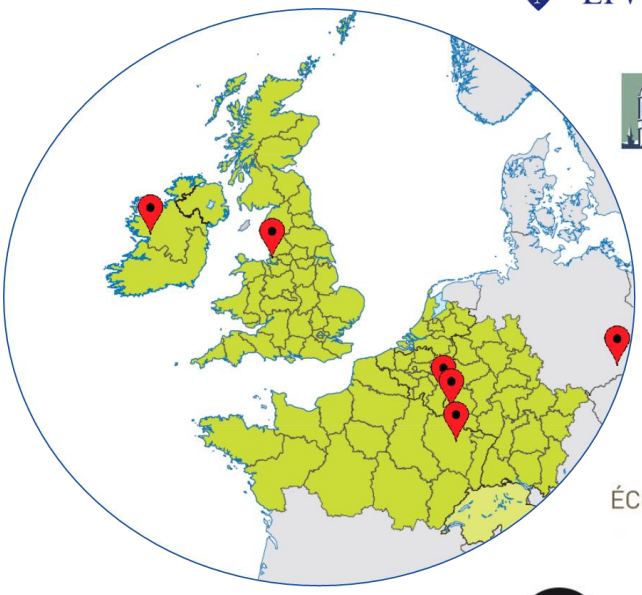

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