

Thermally Modified European Beech

Common or Copper or European beech (*Fagus sylvatica* L.) provides timber of versatile use, most commonly in interior design applications. Its thermal modification increases its durability in a way that allows its use in outdoor applications, too (Use Class 3 acc. to EN 335). The untreated wood of beech is graded under Durability Class 5 (non-permanent). Laboratory tests acc. to EN 350-1 have shown Durability Classes of 2 (permanent) and even 1 (permanent) for TMT beech. Open-air tests and other tests performed by the IHD seem to confirm these findings.

Apart from its low durability, untreated beech is subject to a comparatively high degree of swelling and shrinking. Thermal modification reduces them clearly, by about 50 %. It must be noted that the differential swelling and shrinkage hardly change; however, the clear reduction in equilibrium moistures results in respectively low shrinking and swelling.

Table 1: Equilibrium moisture content and differential swelling ration of TMT beech*, compared to untreated beech

Wood species	Equilibrium moisture [%] in climates as indicated				Different swelling [%/%)	
	20/35	20/65	20/85	23/50	radially	tangentially
TMT Beech	4,0	5,0	7,0	4,8	0,22	0,43
Beech untreated	8,3	11,5	18,5	11,0	0,21	0,42

*) The data were determined at TMT beech from open process (atmospheric pressure). Equilibrium moisture content of TMT from a closed process can be higher

But what is of greater importance is its maximum swelling which occurs following persistent exposure to moisture since, despite reduced equilibrium moistures, TMT can absorb water through capillary intake. It must be assumed that the moisture of TMT at installation is very low at about 4-6 %.

For beech modified at 200 °C a swelling value of 1,9 % (radially) and 3.8 % (tangentially), respectively, was determined 14 d of being soaked in water; for comparison: according to the "Holzatlas" (Wagenführ 2007) the shrinkage rate of beech is 5.8 % (rad) and 11,8 % (tan), respectively. Despite the remarkable reduction to about one third, 4 % of swelling (radially) at 145 mm floorboard width still mean almost 6 mm. GD Holz states in its fact sheet for terraces a minimal spacing of 4 mm in a fully swelled state. 8-10 mm gap width is indicated as a measurement proven in practice 8-10 mm when laying the boards.

Even after thermal modification, beech shows higher swelling and shrinkage values as compared to other species of wood and is thus more likely prone to cracking. Cracks occur due to internal tension which exists in the wood already (growth-related tension) or which is caused by pre-drying or thermal treatment, respectively. Under certain conditions, such tensions are released not until much later, e.g., due to changes in temperature and moisture when exposed to weather, and become apparent in the form of cracks. Therefore, as it has been observed in some cases, TMT beech in exterior applications will show cracks after some time has lapsed. Hence, pre-drying and thermal treatment should be applied with special care. Experience has also shown that red heartwood of beech is increasingly prone to cracking. It is recommended therefore to abstain from using the red heartwood of beech for making TMT.

It is generally true for thermally modified timbers that they are, as it is also the case with untreated, natural wood, not resistant to light if no additional protective treatment is applied. Also the occurrence of wood-discolouring fungi on their surfaces is possible. Should these effects be prevented or delayed, appropriate surface protection, preferably using pigmented products, should be applied.

Institut fuer Holztechnologie
gemeinnuetzige GmbH

Zellescher Weg 24
01217 Dresden · Germany

+49 351 4662 0
+49 351 4662 211
info@ihd-dresden.de
www.ihd-dresden.com

Contact persons



Thermowood, Wood Finishing

Dr. rer. silv.

Wolfram Scheiding

+49 351 4662 280

wolfram.scheiding@ihd-dresden.de



Wood Science, Wood Preservation

Prof.

Bjoern Weiss

+49 351 4662 270

bjoern.weiss@ihd-dresden.de