

Suitability of TMT as a material for windows and external pedestrian doorsets

The main aspects of the use of TMT as a frame material for windows and external pedestrian doorsets are increased durability against wood-destroying fungi, reduced swelling and shrinkage as well as reduced thermal conductivity. The durability of most TMT woods is in the range of classes 1 „very durable“ to 3 „moderately durable“. The equilibrium moisture as well as swelling and shrinkage measures are reduced by approx. 50 %. The reduction of mechanical strength and embrittlement of the wood as a result of the modification have a limiting effect.

Normative basics (windows and exterior doors)

For windows and external doors (without fire protection and/or smoke tightness), the CE marking has been required by law since 01.02.2010. The basis is EN 14351-1 (current edition: 2016-12), which is independent of the material and therefore also applies to windows and exterior doors in which TMT is used. The marking is carried out independently by the manufacturer (or importer) in accordance with conformity level 3. To this end, mandated properties must be specified after an initial

The treatment intensity should be chosen in such a way that an optimal property profile is achieved. The highest possible durability should not be the target value, because technical regulations usually require durability class 3; however, this should certainly be achieved. The window and door design and the processing steps during production must be coordinated with the specific property profile. The suitability of a TMT for window or door constructions must be determined by tests.

test (ITT), and a factory production control (FPC) must be introduced and maintained permanently. For properties for which no performance has been determined or for which the determined performance is not to be declared, the abbreviation NPD (no performance determined) can be specified (but only if there are no legal requirements in the country of destination). In Germany, for example, key figures for the heat transfer coefficient and air permeability are required by building law.

Wood selection, required qualities

The use of TMT as a frame material requires the guarantee of the wood properties relevant to the intended use. For each specific TMT, therefore, at least the wood species, sorting, process or treatment stage and batch or production date must be indicated. This is also required for declarations in accordance with CEN/TS 15679. In general, a quality according to class J2, blue stain free according to EN 942, is recommended. The statements of EN 13307-1, EN 14220, EN 14221 and technical regulations (in Germany e.g. the VFF leaflets HO.02, HO.06-1, HO.06-4 and HO.11) must be observed.

Batten production

Laminated scantlings can be made entirely or partially from TMT. Suitable adhesives for surface and tine bonding are PVAc (D4), EPI or PUR adhesive systems. The suitability for TMT must be approved by the adhesive manufacturer and its recommendations must be observed; if necessary, suitability tests must be carried out and the bonding conditions must be adapted.



trim with combined sashes; outer laminate made of TMT

The suitability of frame materials for window construction can be determined on the basis of the VFF leaflet HO.06-4:2016-03 „Holzarten für den Fensterbau - Teil 4: Modifizierte Hölzer“. The leaflets of the German Window + Facade Association (VFF) are usually considered the recognised rule of technology (at least in Germany). Window manufacturers who have to comply with

Manufacturing

Profiling

Profiling can be carried out with standard tools and settings. Tool sharpness is a decisive prerequisite for high-quality machining, especially with TMT; the feed speed may have to be adjusted. Sharp-edged profiles should be avoided and profile

Surface coating

TMT also requires a high-quality and complete coating. It may be necessary to eliminate intermediate sanding, as the fibres are less crushed during profiling. Since the UV resistance of TMT is not improved compared to native wood, thick-layered and sufficiently pigmented coating systems are recommended.

Glazing, waterproofing, fasteners and fittings

Preliminary tests with the specific TMT are required to test the compatibility and suitability of sealants, sealing profiles and blocks (see VFF leaflet HO.06-4). Screw connections should be pre-drilled. In the case of fittings, the requirements from the

Construction

The window and door constructions that have proven themselves with native wood can be transferred to building elements made of or with TMT if the material-specific features described above are observed and subject to the aforementioned restrictions. All types (posts, girders, mullions), fixed glazing, etc. are possible, as are all known window systems such as single windows, composite windows, box windows and material com-

Product features and areas of application

In principle, windows and external doors made with TMT are not expected to be serviceable. However, restrictions can result from the reduced strength properties, e.g. in the case of increased impact stress, higher wind loads or heavy or larger window sashes or door leaves. Constructions with TMT should be tested with regard to mechanical-dynamic loads, e.g. according to EN 12211 „Safety test“ and EN 13049 „Impact resistance“. Due to the reduced strength, scantlings made of TMT

the quality specifications of RAL-GZ 695 for wooden windows may only use approved frame materials. VFF approvals for modified timber are available for Accoya® and Kebony® in the form of supplements to HO.06-4. For laminated window scantlings with TMT, an approval procedure is currently underway at the VFF.

edges rounded. When sanding TMT, very fine wood dust is produced, so that a well-functioning exhaust system is particularly important.

If the coating is damaged, it may be infested by blue stain fungi, as TMT does not contain any biocidal substances. Due to improved dimensional and shape stability as well as less cracking, it may be possible to extend the maintenance intervals.

area of burglary resistance apply. Due to the lower pH values of TMT, dark complex compounds can form when they come into contact with ferrous metals and the presence of moisture, as is known for tannin-rich woods (oak, larch).

binations (e.g. wood-aluminium). Regardless of the increased durability of TMT, all possibilities of structural wood protection should be exhausted. For the frame corner connections, the above-mentioned notes on sash production apply analogously. Glued slot, tenon and dowel connections as well as mechanical connections are possible.

are not recommended for burglar-resistant building elements; this may be possible with combined sashes (fittings mounted in native wood). In any case, the construction must be adapted and tested to meet the specific requirements. A special aspect results from the reduced thermal conductivity compared to native wood of the same wood species. Depending on the design, the value for the thermal resistance of the entire window or component (U_w) can be improved by 0.1 to 0.2 W/m²K.

Bibliography

EN 14351-1:2006+A2:2016, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets

VFF-Merkblatt HO.02: 2008-12, Auswahl der Holzqualität für Holzfenster und -Haustüren

VFF-Merkblatt HO.06-4:2016-03, Holzarten für den Fensterbau - Teil 4: Modifizierte Hölzer

VFF-Merkblatt HO.11:2020-09, Holzschutz bei Holz- und Holz-Metall-Fenstern, -Haustüren, -Fassaden und -Wintergärten

International Thermowood Association: Thermowood Handbook (www.thermowood.fi)



Daniel Münch

+49 351 4662 399
daniel.muench@ihd-dresden.de

**Institut für Holztechnologie
gemeinnützige GmbH**
Zellescher Weg 24
01217 Dresden

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

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