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Thermal Modified Timber - Definitions and characteristics

Thermisch modifiziertes Holz - Definitionen und Eigenschaften

Bois modifié thermiquement - Définitions et caractéristiques

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Thermal Modified Timber - Definitions and characteristics

Bois Modifié Thermiquement - Définitions et caractéristiques

Thermisch modifiziertes Holz - Definitionen und Eigenschaften

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (CEN/TS 15679:2007) has been prepared by Technical Committee CEN/TC 175 “Round and sawn timber”, the secretariat of which is held by AFNOR.

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Introduction

The principal changes on thermal modification of timber - compared with untreated wood – are improved dimensional stability and increased resistance to decay by wood destroying fungi, and in some cases changed colours..

Due to the treatment, equilibrium moisture content of thermally modified timber is reduced.

Because of altered strength properties comparing to untreated wood, for the use of TMT, it is essential that the relevant requirements of European and national Standards be taken into consideration.

Thermal modification may have an influence on reaction to fire properties of timber.

The properties of thermally modified timber and the degree that the property changes is dependent of the wood species, the type of technology and the process parameters, particularly the treatment temperature level.

The altering of acoustic properties can be of interest particularly for musical instruments.

Some tests have shown an increased resistance of TMT against some insects. Improved resistance against termites has not been proved. Requirements on resistance against termites in some EU member states are to be taken into consideration.

The technologies for manufacturing thermally modified timber are mainly characterized by the way they reduce the oxygen concentration during treatment. The currently applied, industrial scale processes are using atmospheres of heated air and or steam or heated nitrogen or in a bath of heated oil.

1 Scope

This Technical Specification gives definitions and characteristics for Thermally Modified Timber. TMT is used in interior (dry, humid) and exterior conditions.

NOTE 1 TMT is usually a semi-finished product; applications are e.g. flooring, panelling, cladding, decking, windows, doors, furniture and other internal and external joinery. Where product standard exist, the given requirements and test methods are to be taken into consideration.

NOTE 2 Use in load bearing applications – reference to relevant EN standards should be made.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 20-2, *Wood preservative – Determination of the protective effectiveness against Lyctus brunneus (Stephens) – Part 2: Application by impregnation (Laboratory method)*

EN 47, *Wood preservatives – Determination of the toxic values against larvae of Hylotrupes bajulus (Linnaeus) – (Laboratory method)*

EN 84, *Wood preservatives – Accelerated ageing of treated wood prior to biological testing – Leaching procedure*

EN 113, *Wood preservatives – Test method for determining the protective effectiveness against wood destroying basidiomycetes – Determination of the toxic values*

EN 117, *Wood preservatives – Determination of toxic values against Reticulitermes species (European termites) (Laboratory method)*

EN 204, *Classification of thermoplastic wood adhesives for non-structural applications*

EN 252, *Field test method for determining the relative protective effectiveness of a wood preservative in ground contact*

EN 275, *Wood preservatives – Determination of the protective effectiveness against marine borers*

EN 301, *Adhesives, phenolic and aminoplastic, for load-bearing timber structures – Classification and performance requirements*

EN 335-1, *Durability of wood and wood-based products – Definition of use classes – Part 1: General*

EN 335-2, *Durability of wood and wood-based products – Definition of use classes – Part 2 : Application to solid wood,*

EN 350-1, *Durability of wood and wood-based products – Natural durability of solid wood – Part 1: Guide to the principles of testing and classification of the natural durability of wood*

EN 383, *Timber Structures – Test methods – Determination of embedment strength and foundation values for dowel type fasteners*

EN 408, *Timber structures – Structural timber and glued laminated timber – Determination of some physical and mechanical properties*

EN 460, *Durability of wood and wood-based products – Natural durability of solid wood – Guide to the durability requirements for wood to be used in hazard classes*

ENV 807, *Wood preservatives – Determination of the effectiveness against soft rotting micro-fungi and other soil inhabiting micro-organisms*

prCEN/TS 839, *Wood preservatives – Determination of the protective effectiveness against wood destroying basidiomycetes - Application by surface treatment.*

EN 844-1, *Round and sawn timber – Terminology – Part 1 : General terms common to round timber and sawn timber*

EN 844-2, *Round and sawn timber – Terminology – Part 2 : General terms relating to round timber*

EN 844-3, *Round and sawn timber – Terminology – Part 3 : General terms relating to sawn timber*

EN 844-4, *Round and sawn timber – Terminology – Part 4 : Terms relating to moisture content*

EN 844-5, *Round and sawn timber – Terminology – Part 5 : Terms relating to dimensions of round timber*

EN 844-6, *Round and sawn timber – Terminology – Part 6 : Terms relating to dimensions of sawn timber*

EN 844-7 *Round and sawn timber – Terminology – Part 7: Terms relating to anatomical structure of timber*

EN 844-8, *Round and sawn timber – Terminology – Part 8 : Terms relating to features of round timber*

EN 844-9, *Round and sawn timber – Terminology – Part 9 : Terms relating to features of sawn timber*

EN 844-10, *Round and sawn timber – Terminology – Part 10 : Terms relating to stain and fungal attack*

EN 844-11, *Round and sawn timber – Terminology – Part 11 : Terms relating to degrade by insects*

EN 844-12, *Round and sawn timber – Terminology – Part 12 : Additional terms and general index*

EN 927-6, *Paints and varnishes - Coating materials and coating systems for exterior wood – Part 6 : Exposure of wood coatings to artificial weathering using fluoresdent UV lamps and water*

EN 1001-2, *Durability of wood and wood based products – Terminology - Part 2: Vocabulary*

EN 1380, *Timber structures – Test methods – Load bearing nailed joints*

EN 1382, *Timber structures – Test methods – Withdrawal capacity of timber fasteners*

EN 1534, *Wood and parquet flooring – Determination of resistance to indentation (Brinell) – Test method*

EN 1910, *Wood and parquet flooring and wood panelling and cladding – Determination of dimensional stability*

EN 1995-1-1, *Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings*

CEN/TS 12037, *Wood preservatives – Field test method for determining the relative protective effectiveness of a wood preservative exposed out of ground contact – Horizontal lap-joint method*

ENV 12169, *Criteria for the assessment of conformity of a lot of sawn timber*

EN 12524, *Building materials and products – Hygrothermal properties – Tabulated design values*

EN 12664, *Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance*

EN 13183-1, *Moisture content of a piece of sawn timber - Part 1: Determination by oven dry method*

EN 13501-1, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 13823, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 14762, *Wood flooring, Sampling procedures for evaluation of conformity*

prCEN/TS 15397, *Wood preservatives – Method for natural preconditioning out of ground contact of treated wood specimens prior to biological laboratory test*

EN 20105-A03, *Textiles - Tests for colour fastness - Part A03: Grey scale for assessing staining (ISO 105-A03:1993)*

EN ISO 179-1, *Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test (ISO 179- 1:2000)*

EN ISO 2409, *Paints and varnishes - Cross-cut test (ISO 2409:1992)*

EN ISO 4624, *Paints and varnishes – Pulloff test for ahesion (ISO 4624: 2002)*

EN ISO 9239-1, *Reaction to fire tests for floorings – Part 1 : Determination of the burning behaviour using a radiant heat source (ISO 9239-1:2002)*

EN ISO 16000-9, *Indoor air – Part 9 : Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method (ISO 16000-9:2006)*

ISO 7724-1, *Paints and varnishes -- Colorimetry -- Part 1: Principles*

ISO 7724-2, *Paints and varnishes -- Colorimetry – Part 2 : Colour measurement*

ISO 7724-3, *Paints and varnishes -- Colorimetry – Part 3 : Calculation of colour differences*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 844 part 1 to part 12 and in EN 1001-2:2005 and the following apply.

3.1
thermally modified timber
Wood at which the composition of the cell wall material and its physical properties are modified by the exposure of temperature higher than 160 ºC and conditions of reduced oxygen availability. The wood is altered in such way that at least some of the wood properties are permanently affected through the cross section of the timber

3.2
dry conditions
as defined in the Eurocode EN 1995-1-1 as Service class 1 and in EN 335-1 as Use class 1.

Service class 1 is characterised by moisture content in the materials corresponding to a temperature of 20 ºC and the relative humidity of the surrounding air only exceeding 65% for a few weeks per year. Use class 1 is

the situation in which the wood or wood-based product is under cover, fully protected from the weather and not exposed to wetting

3.3
humid conditions
as defined in the Eurocode EN 1995-1-1 as Service class 2 and in EN 335-1 as Use class 2

Service class 2 is characterised by moisture content in the materials corresponding to a temperature of 20 ºC and the relative humidity of the surrounding air only exceeding 85% for a few weeks per year. Use class 2 is the situation in which the wood or wood-based product is under cover and fully protected from the weather but where high environmental humidity can lead to occasional but not persistent wetting

3.4
exterior conditions
as defined in the Eurocode EN-1995-1-1 as Service class 3 and in EN 335-1 as Use classes 3 to 5.

Service class 3 is characterised by climate conditions leading to higher moisture contents than in service class 2. Use class 3 is the situation in which the wood or wood-based product is not covered and not in contact with the ground. It is either continually exposed to the weather or is protected from the weather but subject to frequent wetting Use class 4 Is the situation in which the wood or wood-based product is in contact with the ground or fresh water and thus is permanently exposed to wetting Use class 5 is the situation in which the wood or wood-based product is permanently exposed to salt water

3.5
dimensional stability
capacity to resist to change in product dimension related to the change of the moisture content of wood (MC) or relative humidity of the surrounding air

3.6
anti shrinkage/swelling efficiency (ASE)
relative reduction of specific swelling/ shrinkage ratio of TMT referred to that of untreated wood of the same species

4 Symbols and abbreviations

TMT = Thermally Modified Timber

ASE = Anti shrinkage/swelling efficiency

EMC = Equilibrium moisture content

RH = Relative humidity

MOE = Modulus of elasticity

MC = Moisture content

dcr = cumulative relative dimensional change.

5 Characteristics

5.1 General

Different characteristics are relevant in different end uses. Producer referring to this CEN/TS has to declare at least the characteristics of his product defined in 5.2 to 5.4. Other characteristics shall be determined when

they are relevant for the end application or region. In some countries, properties defined in e.g. 5.6.1 or 5.12 shall be declared.

If standards respectively data are referring to MC values for untreated wood in specific climates (e.g. 12 % in climate 20°C and RH : 65%), for TMT the EMC value at the corresponding climate shall be used.

NOTE Further information on characteristics can be found in Bibliography