

BS EN 350:2016

BSI Standards Publication

Durability of wood and wood-based products — Testing and classification of the durability to biological agents of wood and wood-based materials

bsi.

National foreword

This British Standard is the UK implementation of EN 350:2016. It supersedes BS EN 350-1:1994 and BS EN 350-2:1994 which are withdrawn. BSI, as a member of CEN, is obliged to publish EN 350 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.

Changes from the previous version of EN 350 mean that field testing is no longer a requirement to measure durability class. Laboratory testing may now be used but ageing procedures are not required for these. Consequently durability classes can be assigned to wood with no consideration of ageing. Annex F of this standard correctly states that field tests and ageing procedures are required where performance is a consideration.

The UK committee's opinion is that durability class is not a useful measure unless it is used in the context of how a material may perform in use. Durability classes calculated using the normative text of this standard may therefore not be useful when considering how a wood species or wood-based material might perform. It is also the UK committee's opinion that testing in accordance with informative Annex F (section F.2 paragraph 2) is essential to deliver a useful durability measure.

The UK participation in its preparation was entrusted to Technical Committee B/515, Wood preservation.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2016.
Published by BSI Standards Limited 2016

ISBN 9780580878954

ICS 79.040

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2016.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD
NORME EUROPEENNE
EUROPÄISCHE NORM

EN 350

August 2016

ICS 79.040

Supersedes EN 350-1:1994, EN 350-2:1994

English Version

**Durability of wood and wood-based products -Testing and
classification of the durability to biological agents of wood
and wood-based materials**

Durabilité du bois et des matériaux dérivés du bois-
Méthodes d'essai et de classification de la durabilité
vis-à-vis des agents biologiques du bois et des
matériaux dérivés du bois

Dauerhaftigkeit von Holz und Holzprodukten-Prüfung
und Klassifikation der Dauerhaftigkeit von Holz und
Holzprodukten gegen biologischen Angriff

This European Standard was approved by CEN on 18 June 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPAISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2016 CEN All rights of exploitation in any form and by any means reserved
worldwide for CEN national Members.

Ref.No. EN 350:2016 E

Contents	Page
European foreword	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Sampling of wood and wood-based materials to be tested	8
4.1 Testing wood species	8
4.1.1 General	8
4.1.2 Sampling logs	8
4.1.3 Sampling sawn timber	9
4.2 Testing of sets of wood	9
4.3 Testing of wood-based materials	9
5 General principles for testing and classification	9
5.1 General principles for testing wood specimens	9
5.2 General principles for the classification of durability	10
6 Test methods and classification system	11
6.1 Durability to wood-destroying fungi	11
6.1.1 General	11
6.1.2 Testing durability against basidiomycete and soft-rot fungi	12
6.2 Durability to larvae of dry wood-destroying beetles	14
6.3 Durability to termites	14
6.4 Durability to marine organisms	15
Annex A (informative) Example of scheme for sampling heartwood	16
A.1 Logs	16
A.2 Centralboards	17
Annex B (informative) Guide to biological durability and treatability of wood species marketed in Europe	18
B.1 General	18
B.2 Wood species	18
B.3 Sapwood /heartwood	19
B.4 Treatability	19
B.5 Additional notes in Tables B.1, B.2, and B.3	20
B.6 Convention on International Trade in Endangered Species (CITES)	20
B.7 Adding new wood species or adjust data in Table B.1	20
Annex C (informative) Classification of treatability with aqueous wood preservatives	58
Annex D (informative) Classification of permeability to water	60
D.1 General	60
D.2 Principles for classification of permeability to water	60

Annex E(informative) Testing durability to disfiguring fungi	61
E.1 General	61
E.2 Testing durability to disfiguring fungi	61
E.3 Classification of durability to disfiguring fungi	61
Annex F(informative) Classification of performance	62
F.1 General	62
F.2 Principles of the assessment of performance	62
F.3 Principles of the classification of performance	63
Annex G(informative) Form to be used for the inclusion of new data on wood species/ wood -based material	64
Bibliography	67

European foreword

This document (EN 350:2016) has been prepared by Technical Committee CEN/TC 38 "Durability of wood and wood-based products", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN350-1:1994 and EN 350-2:1994.

Wood durability is an important factor that influences the service life of a wood product. This standard provides input to service life prediction of wood and wood-based products. It is intended to give guidance on using wood products appropriate for different end-uses avoiding excessive requirements. It also ranks durability against wood-decay organisms of various wood species thereby allowing species of appropriate durability to be selected for a particular use. It will however be emphasized that the biological durability rating of wood species given in Annex B cannot be regarded as any guarantee of performance in service.

There are many other factors influencing service life of a wood product, such as the principles of good design, use conditions, climate, maintenance which should be taken into consideration.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard gives guidance on methods for determining and classifying the durability of wood and wood-based materials against biological wood-destroying agents.

The methods can be applied either to individual wood species, batches of wood and processed wood-based materials, including heat-treated, preservative-treated wood and modified wood. However, this standard is not intended to replace testing of the efficacy of biocides.

The wood-destroying agents considered in this standard are:

- wood-decay fungi (basidiomycete and soft-rot fungi);
- beetles capable of attacking dry wood;
- termites;
- marine organisms capable of attacking wood in service.

Data on the biological durability of selected wood species considered of economic importance in European countries are presented in Annex B (informative), which also provides information relating to their geographical origin, density, sapwood width and treatability.

NOTE Treatability, durability to disfiguring fungi, permeability to water and performance in use of wood and wood-based materials are also important issues. However, because standardized methods aiming to assess and classify these factors do not exist and/or have not been extensively experienced yet, preliminary guidance is given in Annex C (informative) for the classification of wood treatability with aqueous wood preservatives, Annex D (informative) for the classification of the permeability to water, Annex E (informative) for the durability to disfiguring fungi, and Annex F (informative) for the classification of performance.

2 Normative references

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

EN 20-1, Wood preservatives - Determination of the protective effectiveness against Lyctus Brunneus (Stephens) - Part 1: Application by surface treatment (laboratory method)

EN 46-1, Wood preservatives - Determination of the preventive action against recently hatched larvae of Hylotrupes bajulus (Linnaeus) - Part 1: Application by surface treatment (laboratory method)

EN 49-1, Wood preservatives - Determination of the protective effectiveness against Anobium punctatum (De Geer) by egg-laying and larval survival - Part 1: Application by surface treatment (Laboratory method)

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

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

ENV 12038, Durability of wood and wood-based products - Wood-based panels - Method of test for determining the resistance against wood-destroying basidiomycetes

EN 13556, Round and sawn timber - Nomenclature of timbers used in Europe

CEN/TS 15083-1, Durability of wood and wood-based products - Determination of the natural durability of solid wood against wood-destroying fungi, test methods - Part 1: Basidiomycetes

CEN/TS 15083-2, Durability of wood and wood-based products - Determination of the natural durability of solid wood against wood-destroying fungi, test methods - Part 2: Soft rotting micro-fungi

EN 16449, Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide

ISO 13061-2, Physical and mechanical properties of wood—Test methods for small clear wood specimens —Part 2: Determination of density for physical and mechanical tests

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

wood species

trade name according to EN 13556 which can on occasion include more than one botanical tree species

Note 1 to entry: E.g. European oak which comprises both *Quercus robur* and *Q. petraea*.

3.2

pilot name for a wood species

result of a consensual choice due to practical considerations retaining the usual name under which the wood is the most widely commercialised, adopted either by the main exporting country or by the main importing country

Note 1 to entry: Pilot names are established since 1954 in the nomenclature of the ATIBT.

3.3

set

clearly identifiable collection of units of wood or wood-based products, originating from a commercial supply of a defined origin (single or not) and likely comprising only some of the variability of the wood species or of the wood-based material

Note 1 to entry: E.g. wood species sourced from a restricted geographical area.

3.4

wood-based material

any processed matrix containing and/or made of a specific percentage of wood

Note 1 to entry: Wood-based materials are those derived from trees and include amongst others heat-treated wood and any other material modified by chemical, physico-chemical or physical process, glue-laminated wood, wood-based panels, wood polymer composites and treated with wood preservatives. This standard is not meant to test all ligno-cellulosic materials (e.g. bamboo, reed, straw, flax) as such and would require methodological adaptations to do so.

3.5

modified wood

wood that undergoes the action of a chemical, biological or physical agent, resulting in a permanent desired property enhancement

Note 1 to entry: If the modification is intended for improved resistance to biological attack, then the mode of action is assumed to be non-biocidal.

3.6

durability to biological agents

inherent resistance of a wood species or a wood-based material against wood decay organisms

Note 1 to entry: This inherent resistance is due to the presence of natural components that can exhibit different levels of toxicity towards biological organisms and/or to anatomical particularities or a specific constitution of certain wood-based materials.

3.7

sapwood

outer zone of wood that, in the growing tree, contains living cells and conducts sap

Note 1 to entry: Depending on the species, age of the tree and the growing conditions the proportions of sapwood and heartwood can vary.

Note 2 to entry: Frequently paler than heartwood though not always distinguishable from heartwood in some wood species.

Note 3 to entry: Sapwood of all wood species is considered to be non-resistant against decay fungi unless other data are available. Sapwood can have different levels of resistance against wood boring insects (excluding termites).

3.8

heartwood

inner zone of wood that, in the growing tree, has ceased to contain living cells or to conduct sap

Note 1 to entry: Frequently darker than sapwood though not always distinguishable from sapwood in some wood species.

3.9

transition wood

wood in a zone between the sapwood and the heartwood

Note 1 to entry: The transition wood can be regarded as a region of the heartwood that has not fully matured. This is only distinguishable in very few wood species. In general, its biological durability, treatability and permeability to water is intermediate between that of sapwood and heartwood.

3.10

juvenile wood

set of few growth rings of woody tissue nearest the centre of the tree, often having abnormal properties

Note 1 to entry: Juvenile wood is a zone near to the pith, displaying marked ring to ring changes in its properties. There is no clear consensus as to where this zone ends. It is generally thought to end at 10 to 20 rings from the pith, but it depends on the wood species.

Note 2 to entry: The durability, permeability to water and treatability of juvenile wood can be different from that of mature heartwood.

ease with which water penetrates a wood-based matrix (wood of a particular species, wood-based material) and is released by evaporation

ability of a wood species or a wood-based material to withstand deterioration over time

Depending on the selected test method, additional specimens might be required to determine the density of the wood species and the moisture content of the specimens. The sampling shall be done according to the relevant standards (ISO 13061-2 for density and ISO 13061-1 for moisture content).

NOTE3 A scheme of a suitable preparation and distribution of the specimens for testing is showed in Annex A

4.1.3 Sampling sawn timber

Wood placed on the market is mostly available as sawn timber and hence it is difficult to identify pieces originating from specific trees. For this reason, it is preferred to sample as many pieces as possible so as to better estimate the overall durability. A minimum of 30 pieces originating from minimum 5 batches and providing 1 specimen per piece is required. The general considerations described in 4.1.2 related to sampling also apply for sawn wood.

4.2 Testing of sets of wood

Since timbers are mostly presented on the market as commercial supplies there is a need to assess their durability. A maximum of wood pieces shall be used for the realization of the test specimens (e.g. 2 replicate test specimens from each of 20 pieces are preferred to 10 specimens from each of 4 pieces). To give a good indication on the variability of the tested set of wood, it is recommended to test at least 30 specimens per variable (for example "test method" or "test organism").

4.3 Testing of wood-based materials

The sampling should take into account the variability of the wood-based material to be tested.

For each variation in processing parameter (e.g. a change in temperature, particle size, wood species), a minimum of 30 specimens is required, derived from at least 3 produced items (e.g. boards) sampled at random from 3 different batches. A minimum of 5 specimens from each batch should be tested.

If the material contains both sapwood and heartwood, care has to be taken that both sapwood and heartwood are used to produce the test specimens.

5 General principles for testing and classification

5.1 General principles for testing wood specimens

When testing a wood species, an identification of the tree or the wood species shall be done. Wood species shall be specified according to EN 13556.

In order to get a homogeneous set of samples in terms of moisture content, the test specimens shall be conditioned prior to testing in a ventilated conditioning chamber at controlled temperature and relative humidity, until their weight and moisture content are stabilized.

The sample selection requirement for reference specimens shall follow the instructions of the relevant test method. If several wood species are tested at the same time, one set of reference specimens is sufficient.

Test timber used to determine the durability of a wood species should not be oven-dried at temperatures above 60°C prior to the test.

If laboratory test vessels are used, reference specimens and test specimens shall be tested in separate vessels.

EN 73 or EN 84 are ageing procedures which might be required prior to biological testing

The properties of the test specimen shall, as far as possible, be representative for the wood species being tested even if this does not follow the instruction given on sample selection in the relevant test

standard. However, the results still cannot be expected to take into account the full range of variation of properties within a species.

EXAMPLE 1: If the test method excludes the use of “wood of resinous appearance”, but the species to be tested normally has a naturally resinous appearance, this exclusion is ignored.

EXAMPLE 2: If the test method requires a certain number of growth rings per centimetre, this restriction is ignored if growth rings do not exist or are too widely spaced. This is of importance for some tropical timbers, because it is sometimes impossible to see the growth rings; the rings can also correspond not to the annual growth but to the alternation of dry and wet seasons

5.2 General principles for the classification of durability

The durability of a wood species or a wood-based material to various wood destroying organisms is tested using methods described in relevant European Standards. The use of replicate specimens is a requirement in all test methods.

For wood species, durability classes refer only to heartwood. Sapwood is always regarded as not durable, unless test data provide different information.

Based on test results, the durability of a wood species or a wood-based material to the various wood-destroying organisms is classified within:

— a five grade scale for decay basidiomycete fungi and soft rotting micro-fungi

Table 1—Durability classes (DC) of wood and wood-based materials to attack by decay fungi

Durability class	Description
DC1	Very durable
DC2	Durable
DC3	Moderately durable
DC4	Slightly durable
DC5	Not durable

NOTE 1 This five-grade scale was initially designed in order to inform on the expected levels of performance of wood when used in contact with ground (service conditions as described for use class 4 in EN 335). Most of the data on biological durability against fungi, reported in Annex B, are derived from field tests, mainly performed according to the EN 252 standard. In other use classes, the service conditions can result in wood performance which differs from that implied by this classification.

a two grade scale for beetles (*Hylotrupes bajulus*, *Anobium punctatum*, *Lyctus brunneus* and *Trichoferus holosericeus* Rossi (= *Trichoferus holosericeus cinereus*)

Table 2—Durability classes (DC) of wood and wood-based materials to attack by wood-boring beetles

Durability class	Description
DC D	Durable
DCS	Not durable

Durability to *Hylotrupes bajulus* is only given for softwoods (see Annex B, Table B.1) as hardwoods are not attacked.

Durability to *Lyctus brunneus* is not mentioned in the list (see Annex B, Tables B.2 and B.3) as only the wood of starch-containing hardwood species with pores of suitable width is susceptible. For species with highly susceptible sapwood a specific note appears in the 'Remarks' column. Softwoods are not attacked.

Durability to Trichoferus holosericeus, which only attacks hardwoods in Southern Europe, is mentioned in the 'Remarks' column if a wood species is known as highly susceptible.

NOTE 2 The classification of a wood species or wood-based material as 'not durable' does not necessarily indicate that different products made with this material will be equally destroyed during their life in service. Susceptibility to insect attack may change over time through chemical changes in extractives, such as the fate of starch, which is the main source of food. Additionally, susceptibility of any commodity to biological attack may be influenced by other factors, such as its moisture content, design, maintenance and presence of surface coatings.

— a three-grades scale for termites

Table 3—Durability classes (DC) of wood and wood-based materials to attack by termites

Durability class	Description
DC D	Durable
DC M	Moderately durable
DC S	Not durable

— a three-grades scale for marine organisms (or marine borers)

Table 4—Durability classes (DC) of wood to attack by marine organisms

Durability class	Description
DC D	Durable
DCM	Moderately durable
DC S	Not durable

6 Test methods and classification system

NOTE Annex G provides a template form presenting the information which is required for adding new data to the standard.

6.1 Durability to wood-destroying fungi

6.1.1 General

Durability to a well-defined set of wood-destroying fungi can be assessed by performing laboratory tests (6.1.2.1 and 6.1.2.2).

NOTE Field tests allow determining the durability of a wood species or a wood-based material in different end-uses (above-ground, in-ground) and expose it to a wider range of wood colonising and destroying organisms and long term conditioning through exposure to weather. Laboratory tests are more specific as they are performed under fully controlled conditions.

6.1.2 Testing durability against basidiomycete and soft-rot fungi

6.1.2.1 For solidwood and solid wood-based material

Durability against wood decay fungi based on a laboratory test shall be determined using CEN/TS 15083-1 for basidiomycetes and CEN/TS 15083-2 for softrotting micro fungi.

The criteria for determining durability classes (DC), based on the CEN/TS 15083-1 are presented in Table 5.

Table 5—Durability classes (DC) of wood to fungal attack (basidiomycete fungi)

Durability class	Description	Percentage mass loss (ML)
DC1	Very durable	$ML \leq 5$
DC 2	Durable	$5 < ML \leq 10$
DC3	Moderately durable	$10 < ML \leq 15$
DC4	Slightly durable	$15 < ML \leq 30$
DC5	Not durable	$30 < ML$

ML=highest of the median mass losses (in %) determined for test specimens exposed to each of the used test fungi

The criteria for determining durability classes (DC), based on the CEN/TS 15083-2 are presented in Table 6. In this test, preliminary DC is based on the median of the mass loss for hardwoods or the MOE (apparent modulus of elasticity measured in 3 point bending according to EN 317) for softwoods.

Table 6—Durability classes (DC) of wood to fungal attack (soft rot)

Durability class	Description	x value
DC1	Very durable	$x \leq 0, 10$
DC2	Durable	$0, 10 < x \leq 0, 20$
DC3	Moderately durable	$0, 20 < x \leq 0, 45$
DC4	Slightly durable	$0, 45 < x \leq 0, 80$
DC 5	Not durable	$x > 0, 80$

Hardwoods: $x = \text{median value of mass loss for timber test specimens} / \text{median value of mass loss for reference timber test specimens}$
Softwoods: Calculate the “x value” for the test timber but using loss of MOE.

Wood species known to be not durable should be used to test the virulence of fungi. Commonly, *Pinus sylvestris* sapwood is used for testing softwoods and *Fagus sylvatica* for testing hardwoods.

The validity criteria of the test are given in the corresponding test method.

The durability classification is based on the highest median mass loss determined for all the test specimens exposed to each of the test fungi.

Additional information about the spread of individual mass loss values should be provided. If individual mass loss values are distributed over two durability classes (x and y) with at least 40% of values being in each of them, the retained durability class should not be based on the median mass loss but expressed as falling between “x-y”. High levels of variability should be clearly mentioned in the test report, e.g. by “v” as in the example presented in Table 7.

The spread of individual values can be expressed in test reports based on fitted probability density functions, as presented in Table 7.

Table 7—Example of distribution of classes of mass loss values of the tested material in different durability classes based on fitted probability density functions

Wood species	Median mass loss (%)	%DC1	%DC2	%DC3	%DC4	%DC5	Durability class
A	2, 2	83, 0	15, 6	1, 3	0, 1	0, 0	1
B	7, 3	27, 2	46, 4	21, 8	4, 6	0, 0	2 _v
C	8, 9	23, 5	33, 2	23, 7	19, 0	0, 6	2 _v
D	28, 2	0, 0	0, 0	13, 4	46, 6	40, 0	4–5
“v” indicates that the species exhibits an unusually high level of variability							

6.1.2.2 For wood-based material other than solid wood

The test procedure described in ENV 12038 applies to wood-based products panels and the classification shall be undertaken according to Tables 5 and 6.

NOTE1 CEN/TS 1099 specifies this method for testing biological durability of plywood.

NOTE 2 EN 15534-1 specifies this method for testing biological durability of wood polymer composites

6.1.2.3 Durability of wood and wood-based materials used in-ground

The EN 252 standard provides a method which is suitable for assessing the durability of wood and wood-based materials in direct contact with the ground (use class 4). At least 30 stakes of the test wood species or wood-based material shall be used in place of the impregnated test stakes described in this standard. Stakes of *Pinus sylvestris* sapwood and *Fagus sylvatica* shall be used as references to measure microbiological activity of the field soil throughout the test. They shall be replaced as necessary when they fail.

It is recommended to perform the test in more than one field site.

NOTE The field conditions can vary between different test sites and comparing the results can consequently be difficult.

In the absence of a specific standard providing a test method allowing the determination of durability classes, the average life of wooden stakes used in-ground can be expressed relative to the life of the reference stakes as given in Table 8.

Table 8—Durability classes (DC) to fungal attack for wood used in-ground determined using field tests based on EN 252

Durability class (DC)	Description	Results of field tests expressed as x values
DC 1	Very durable	$x > 5,0$
DC2	Durable	$3,0 < x \leq 5,0$
DC3	Moderately durable	$2,0 < x \leq 3,0$
DC4	Slightly durable	$1,2 < x \leq 2,0$
DC5	Not durable	$x \leq 1,2$
x value = average life of stakes / average life of the more durable set of reference stakes		

6.1.2.4 Durability of wood and wood-based materials used above-ground

Different field test methods, standardized or not, have been developed in order to assess the durability of wood and wood-based materials in above-ground situations (use classes 3) and can be used for that purpose, such as the L-joint (EN 330), lap-joint (CEN/TS 12037), ground proximity and double-layer tests.

It is recommended to perform the test in more than one field site.

NOTE The climate can vary between different test sites and comparing the results can consequently be difficult.

6.2 Durability to larvae of dry wood-destroying beetles

The durability of wood and wood-based materials to attack by *Hylotrupes bajulus*, *Anobium punctatum* and *Lyctus brunneus* shall be tested using procedures based on those in EN 46-1, EN 49-1 and EN 20-1 respectively.

If durability to Trichoferus holosericeus is required, tests shall be carried out as for Hylotrupes bajulus, but using Fagus sylvatica as the reference species.

Specimens of the test wood species (see clause 4) shall be used in place of the preservative treated wood specimens mentioned in those standards.

A wood species or a wood-based material is classified as “not durable” if one or more live insects of the respective test organism are found at the end of the test. If no live insects are found at the end of the respective test, and if the validity criteria for the respective test in the reference species are fulfilled, the test species is classified as “durable”.

NOTE If it is expected, that the durability of a specific wood or wood-based material is based on behavioural aspects of wood destroying adult beetles prior to egg laying, different test methods can need to be applied.

6.3 Durability to termites

The durability of wood and wood-based materials to attack by subterranean termites shall be tested using procedures based on EN 117 in the absence of any other more specific standard. The durability should be tested against the termite genus of major economic importance occurring in the area where the wood is meant to be used.

NOTE 1 Usually, durability is tested on *Reticulitermes* termites in Europe and most frequently on *Coptotermes*, *Nasutitermes* and *Heterotermes* in member state tropical regions outside the European continent, depending on their geographical areas.

Specimens of the test wood species or wood-based material (see section 4) shall be used in place of the preservative treated wood specimens mentioned in EN 117.

The test procedures described in EN 117 result in attack ratings on a scale 0-4. The test shall be considered valid if the reference not durable species has a rating of 4 in the test.

The durability of the species or wood-based material under test shall be classified in accordance with Table 9.

Table 9—Classes of durability of wood species and wood-based materials to termite attack based on EN 117 ratings

Durability class	Description	Rating
DC D	Durable	$\geq 90\%$ “0 or 1” and max 10% “2” a
DC M	Moderately durable	$< 50\%$ “3, 4”
DC S	Not durable	$\geq 50\%$ “3, 4”
a 90% of the test samples rated 0 or 1 and a maximum of 10% of the test samples rated 2 and 0% “3 and 4”		

NOTE 2 Durability class “DC M”, derived from a laboratory test, is of informative value only. Other parameters like population size and dynamics of occurring termites in the intended geographical region, where the wood or wood-based material will be used, need also to be evaluated.

NOTE 3 So far, no standardized European methodology allowing assessing specifically the durability against drywood termites (*Kalotermes flavicollis* and *Cryptotermes spp.*) exists.

6.4 Durability to marine organisms

The durability of wood and wood-based materials to attack by marine organisms shall be tested using procedures based on those described in EN 275.

NOTE Durability to marine borers is best tested in geographical locations where the wood or wood-based material is intended for use to ensure their exposure to as wide a range of marine borers as can be encountered when in service.

Specimens of the test wood species shall be used in place of the preservative treated wood specimens in EN 275.

The reference specimens shall be *Pinus sylvestris* sapwood. Any other not durable species could be added for virulence control. They shall be replaced as necessary when they fail.

The test shall be used to determine the time needed for the test specimens to fail.

The durability of the species under test shall be classified in accordance with Table 10.

Table 10—Classes of durability of wood or wood-based materials to attack by marine organisms using tests based on EN 275

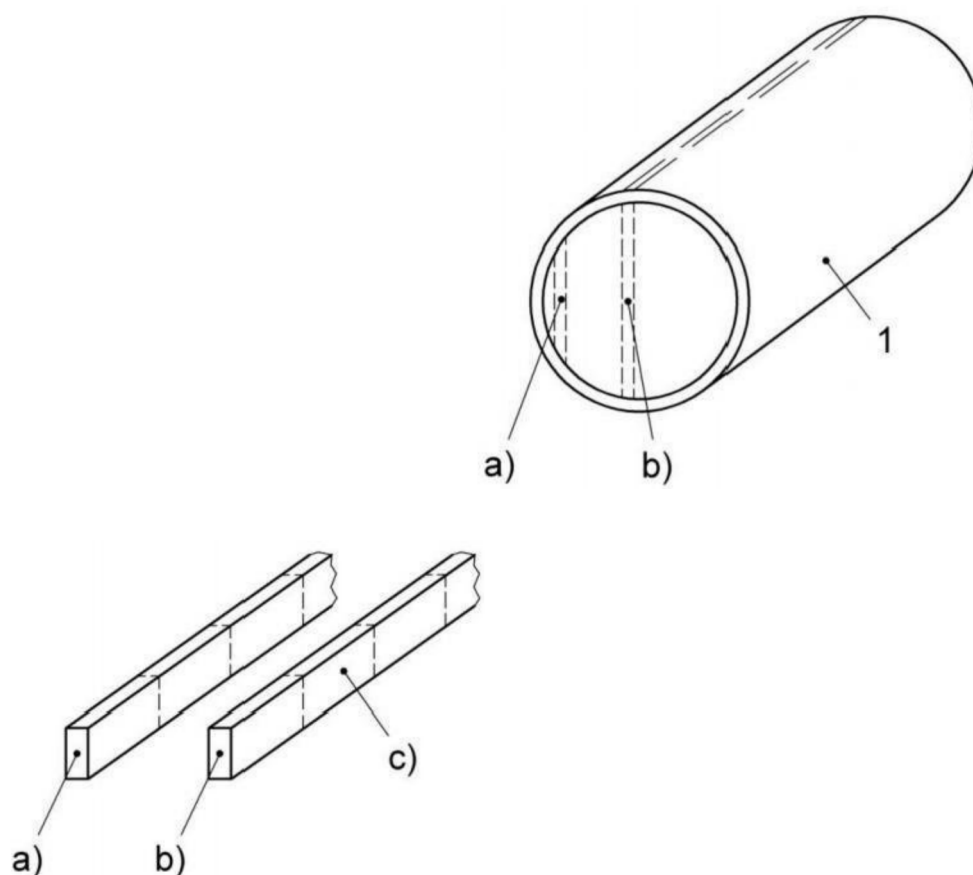
Durability class	Description	Results of field tests expressed as x
DC D	Durable	$x > 5,0$
DCM	Moderately durable	$3 < x \leq 5$
DCS	Not durable	$x \leq 3$
x = average life of test specimens / average life of the more durable set of reference specimens		

Annex A (informative)

Example of scheme for sampling heartwood

A.1 Logs

A scheme for the cutting of laths from logs to represent the outer and inner heartwood is illustrated in Figure A.1. This also shows the cutting of the laths into test specimens. The length of the logs necessary for sampling depends on the amount of specimens required for the relevant test procedure.



Key

1 log

a laths from the outer part of the heartwood

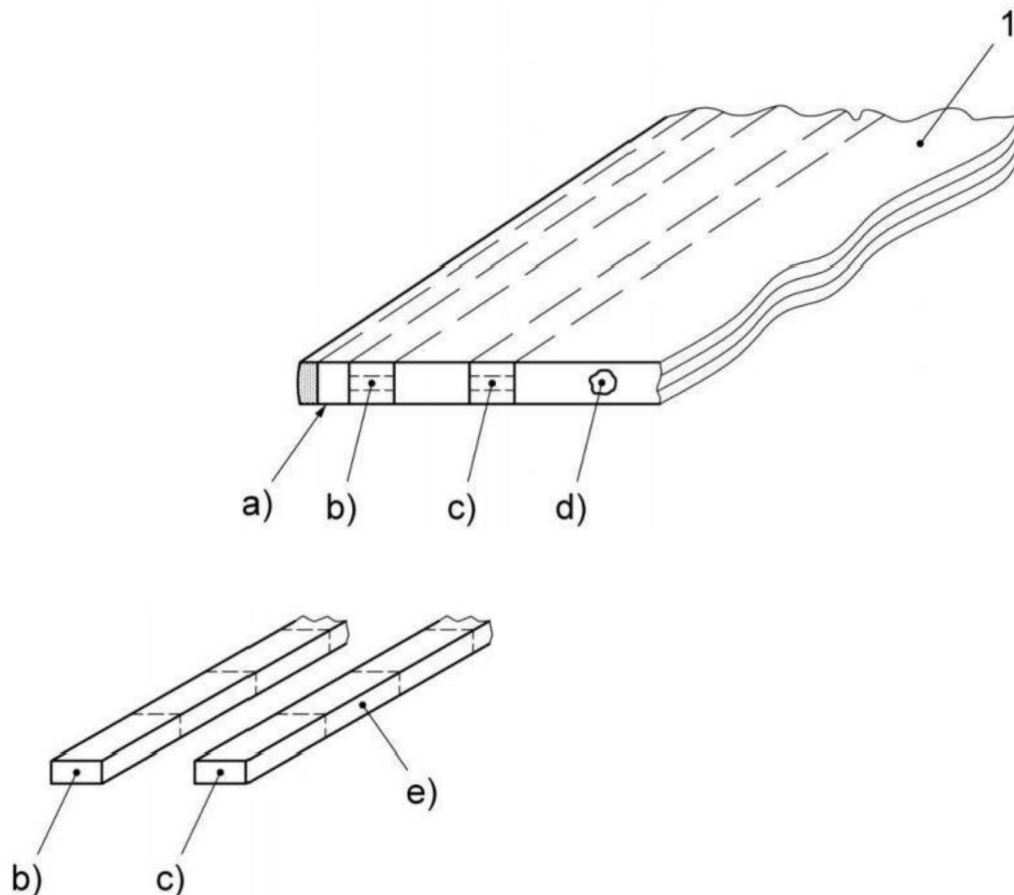
b laths from the inner part of the heartwood

c test specimen

Figure A.1—Sampling from logs(1)-Taking laths from the outer (a)and inner (b)part ofthe heartwood and cutting them into test specimens (c)

A.2 Central boards

A scheme for the cutting of laths from centrally cut boards to represent the outer and inner heartwood is illustrated in Figure A.2. This also shows the cutting of the laths into test specimens. The length of the boards necessary for sampling depends on the amount of specimens required for the relevant test procedure.



Key

- a sap
- b outer part
- c inner part
- d pith
- e test specimens

Figure A.2—Sampling from central boards. Taking laths from the outer and inner part of the heartwood and cutting them into test specimens

Annex B (informative)

Guide to biological durability and treatability of wood species marketed in Europe

B.1 General

Wood is a biological material. Its natural resistance to various forms of biological attack is affected by many factors. Consequently, definitive statements about biological durability cannot be made without having accurate and comprehensive test data. However, based on the information currently available, EN 350 gives guidance on the durability of the heartwood of selected wood species to degradation by a range of organisms.

The data given in the tables are based upon information drawn from various sources, including historical records, practical experience, laboratory tests, field tests and other data. Old data come from the previous version EN 350-2:1994. The omission of a species does not necessarily imply that it is unsuitable for use. A species can have been omitted because it was not considered of sufficient economic importance to be included, or because no or insufficient data were available to classify it.

For fungi, two durability classifications are listed, noted as follows: X(Y). The first one is usually derived from the rating of heartwood stakes exposed half buried outdoors in soil and in some cases combined with the results of laboratory tests performed in-ground situation (soft rot test). The second one is based on the results of laboratory tests aiming to determine the resistance against basidiomycete fungi. Detailed guidance concerning the classification of wood species in relation to fungal degradation in other than ground contact situations is not given as this is a product of a complex interaction of parameters which is not fully mastered.

For wood-boring beetles, different wording is used and different information recorded in Tables B.1, B.2 and B.3:

—*Hylotrupes* appears in Table B.1 but not in Tables B.2 and B.3 because only softwood species are attacked;

The wording "beetles" is used only for tropical species (Table B.3), because only general data with regards to the resistance against wood-boring beetles may be available but not specific data on Anobium (mentioned in Tables B.1 and B.2).

For termites, the classification is based on three resistance classes. However, the class M (moderately durable) is defined based on laboratory tests only, that means that wood species classified as M or S (not durable) will not necessarily perform very differently in real-use conditions. Their performance will depend on the importance of termite infestations, the termite species present and on the time of exposure. This intermediate classification is provided to help ranking wood species and selecting a wood species for a given application and given country (or area of exposure).

Information on other selected characteristics of each wood species is given for the guidance of users.

For end uses where durability is important, the lowest durability of the relevant classes listed for a wood species should be assumed unless specific source-related information is available.

B.2 Wood species

In Tables B.1 to B.4, wood species are listed alphabetically according to their botanical names.

- Table B.1 lists the data for softwoods;
- Table B.2 lists the data for temperate hardwoods;
- Table B.3 lists the data for tropical hardwoods;
- Table B.4 lists woods of different species which are sold together as commercial groupings.

For European species, common names are given in parallel in English, French, and German. For tropical wood species the ATIBT¹ name is given where possible. Other common names are given only if they are widely used.

The origins of common names are indicated as follows:

X	ATIBT pilot name
D	German name
E	English name
F	French name
O	Other names

Information on the origin of the wood species is given when available. Wood properties can vary according to the geographical origin.

Information on density (in kilogram per cubic meter) is included when available in order to provide an indication of physical and mechanical properties. However, no clear correlation exists between density and biological durability or treatability. The density is based on mass/volume at wood moisture content (MC) of 12 % mass fraction. The range refers to commonly encountered values and not to the total possible variation.

B.3 Sapwood/heartwood

In Tables B.1, B.2 and B.3 typical sapwood width is given to indicate its abundance in mature trees and is categorized as follows:

- vs very small (<2 cm);
- s small (2 cm to 5 cm);
- m medium (>5 cm to 10 cm);
- b broad (>10 cm);
- x no distinct differentiation between heartwood and sapwood;
- (x) generally no distinct differentiation between heartwood and sapwood.

B.4 Treatability

Treatability is the ease with which a wood can be penetrated by a liquid (for example a wood preservative).

¹ Association Technique Internationale des Bois Tropicaux.

In Tables B.1,B.2 and B.3 treatability of sapwood and heartwood is categorized as follows:

- 1 easily treated;
- 2 moderately easy to treat;
- 3 difficult to treat;
- 4 extremely difficult to treat;
- n/a insufficient data available;
- v the species exhibits an unusually high level of variability.

B.5 Additional notes in Tables B.1,B.2,and B.3

When necessary,the following additional notes are used:

- v the species exhibits an unusually high level of variability;
- n/a insufficient data available.

B.6 Convention on International Trade in Endangered Species (CITES)

When selecting a wood species for use listed in EN 350,consideration shall be given to whether the selected species is protected by the Convention on International Trade in Endangered Species (CITES) or listed as endangered or critically endangered by the IUCN Redlist.If it is CITES listed it should not be specified for use.

When sourcing a wood species,evidence of appropriate due diligence as required by the EUTR should be sought from suppliers.

B.7 Adding new wood species or adjust data in Table B.1

Annex G provides a template form presenting the information which is required for adding new data to Tables B.1 to B.3 in this standard.

Table B.1—Durability of heartwood and treatability of softwood species

For fungi, two durability classifications is listed, noted as follows: X/Y. The first one is usually derived from the results of laboratory or field tests simulating in-ground situation. The second one is based on the results of laboratory tests aiming to determine the durability against basidiomycete wood-decay fungi.

F	Scientific name	Code acc. to EN 13556	Common name	Origin	Density /kg/dm ³ at 12 % MC	Durability of heartwood				Treatability		Sap wood volume %	Additional data/ information when available
						Fungal decay class	Heartwood	Timber	Antibiotics	Heartwood	Sapwood		
1	<i>Abies alba</i> (L.) (syn. <i>Morus germanica</i>) <i>A. concolor</i> (Mill.) (syn. <i>Abies Douglasii</i>) <i>A. balsamea</i> (Mills.)	SPH SPR SPR	European F-Sapin E-Fir E-Larice E-Weissfichte	Europe N America	420–480	1–2	3	3	3	2–3	2–3	3	Prone to blue stain Not resistant to marine borers
2	<i>Agathis douglasii</i> (L.) <i>Artocarpus alatus</i> (Roxb.) <i>A. speciosus</i> (L.) (Don.) <i>Salix</i> <i>A. sp.</i>	MDA MBA MBS	Agathis B-Fauri B-Agathis B-Agathis	Australia New Zealand Tahiti Papua New Guinea	380–480	3–4	3	3	3	n/a	n/a	3	Prone to blue stain Not resistant to marine borers
3	<i>Acacia mangium</i> (Willd.) <i>Albizia saman</i> (L.) (Poir.) <i>Albizia lebbekii</i> (L.) (Poir.) <i>Albizia saman</i> (L.) (Poir.) <i>Albizia saman</i> (L.) (Poir.)	SPH SPH SPH SPH SPH	Acacia B-Pin B-Pin B-Pin B-Pin	Brazil Brazil Brazil Brazil Brazil	380–480	4–5	3	3	3	1	1	3	Prone to blue stain Not resistant to marine borers
4	<i>Calocedrus decurrens</i> (L.) (Roxb.) <i>Calocedrus decurrens</i> (L.) (Roxb.) <i>Calocedrus decurrens</i> (L.) (Roxb.)	CCC CCC CCC	Calocedrus B-Fir B-Fir B-Fir	N America N America N America N America	420–480	1–2	n/a	n/a	n/a	n/a	n/a	n/a	n/a

N°	Scientific name	Code acc. to EN 13356	Common name	Origin	Density kg/m ³ at 12% MC	Durability to the wood		Treatability		Sap pH	Additional data/ information when available
						30mg HyLot rupes mm	Corrosion class	Heat treat °C	Sap pH		
5	<i>Cedrus atlantica</i> (Endl.) Mill <i>Pinaster</i> ex Carr. <i>C. deodora</i> (R.DC.) G. var <i>Cedrus atlantica</i> (Endl.) <i>Pinaster</i>	EN 13356	Pinaster Pinaster Pinaster Pinaster	Africa, Asia		1-2	0	0	n/a	n/a	Not resistant to marine borers
6	<i>Chamaecyparis macrocarpa</i>	EN 13356	Pinaster Pinaster Pinaster Pinaster	Africa	430- 550	2-3	0	0	5	5	
7	<i>Cryptomeria japonica</i> (DC.) var <i>Cryptomeria japonica</i>	EN 13356	Pinaster Pinaster Pinaster Pinaster	Asia and cultivated in Europe	430- 550	2-3	0	0	5	5	Not resistant to marine borers
8	<i>Pinus resinosa</i> (Ait.) var <i>Pinus resinosa</i>	EN 13356	Pinaster Pinaster Pinaster Pinaster	Asia and cultivated in Europe	430- 550	2-3	0	0	5	5	Treatability and durability of heartwood highly variable
9	<i>Pinus resinosa</i> (Ait.) var <i>Pinus resinosa</i>	EN 13356	Pinaster Pinaster Pinaster Pinaster	Asia and cultivated in Europe	430- 550	2-3	0	0	5	5	Endangered species (classified species in EN 13356)

N°	Scientific name	Code according to EN 13355	Common name	Origin	Density (kg/m³) at 12 & 40°C	Durability of heartwood			Treatability		Sapwood vitality	Additional data/ information when available	
						Dung : 1	Hydrolytic fungus	Arch fungus	Easy treated	Sapwood			
			Dichte										
14	<i>Pinus sylvestris</i> L. Common	PUS	Pinus Sylvestris	Europe	400-450	4-5	1	3	3	2-3	0	Not resistant to marine borers	
			Pinus Sylvestris	Europe	400-450	4-5	1	3	3	2-3	0		
			Pinus Sylvestris	Europe	400-450	4-5	1	3	3	2-3	0		
15	<i>Pinus</i> spp. <i>Pinus murrayana</i> Lamb. <i>Pinus massoniana</i> Lamb.	PMS	Pinus murrayana	Europe	400-450	3	1	0	3	1	0	Not resistant to marine borers	
			Pinus massoniana	Europe	400-450	3	1	0	3	1	0		
			Pinus massoniana	Europe	400-450	3	1	0	3	1	0		
			Pinus massoniana	Europe	400-450	3	1	0	3	1	0		
16	<i>Pinus</i> spp. <i>Pinus edulis</i> Mill. <i>Pinus densata</i> Mill. <i>Pinus densata</i> Mill.	PDE	Pinus edulis	Europe	400-450	3	1	0	3	1	0	Not resistant to marine borers	
			Pinus densata	Europe	400-450	3	1	0	3	1	0		
			Pinus densata	Europe	400-450	3	1	0	3	1	0		
			Pinus densata	Europe	400-450	3	1	0	3	1	0		
17	<i>Pinus</i> spp. <i>Pinus edulis</i> Mill. <i>Pinus densata</i> Mill.	PDE	Pinus edulis	Europe	400-450	4	1	0	3	1	0	Not resistant to marine borers	
			Pinus densata	Europe	400-450	4	1	0	3	1	0		
18	<i>Pinus murrayana</i> Lamb. and var. <i>concolorata</i> Lamb. var. <i>latifolia</i> Lamb.	PMS	Pinus murrayana	Europe	400-450	3-4	1	0	3	1	0	Not resistant to marine borers	

N°	Scientific name	Code acc. to EN 13356	Common name	Origin	Density /kg/m³ at 12 °C	Durability of heartwood				Additional data/ information when available
						Fung Hylotia	Termites	Heartwood	Sapwood	
23	<i>Pinus sylvestris</i> L.	RES	Scots Pine Norway Spruce Pinus sylvestris Pinus sylvestris Pinus sylvestris	Europe	400-420	3-4	3	1	1	Not resistant to marine borers
24	<i>Pinus sylvestris</i> L.	RES	Scots Pine Norway Spruce Pinus sylvestris Pinus sylvestris Pinus sylvestris	Europe	400-420	3-4	3	1	1	Not resistant to marine borers
25	<i>Pinus sylvestris</i> L.	RES	Scots Pine Norway Spruce Pinus sylvestris Pinus sylvestris Pinus sylvestris	Europe	400-420	3-4	3	1	1	Not resistant to marine borers
26	<i>Pinus sylvestris</i> L.	RES	Scots Pine Norway Spruce Pinus sylvestris Pinus sylvestris Pinus sylvestris	Europe	400-420	3-4	3	1	1	Not resistant to marine borers
27	<i>Pinus sylvestris</i> L.	RES	Scots Pine Norway Spruce Pinus sylvestris Pinus sylvestris Pinus sylvestris	Europe	400-420	3-4	3	1	1	Not resistant to marine borers

N°	Scientific name	Code acc. to EN 1336 (3)	Common name	Origin	Density (kg/m³) at 12 % MC	Durability of heartwood			Treatability		Sap wood resistance	Additional data: information where available		
						Fungal decay classes	Hylotrupes inc.	Termites	Boiling water	Sap wood				
Saprophytaceae														
26	Taxus baccata L.	C23C	E Yew	Europe	620-800	2	0	0	n/a	2	2	VS		
			F Yew											
			E Yew											
27	Taxus plicata (Mill.) Mill.		E Western Red Cedar	N America	430-500	2	0	0	0	3-4	3	3	Not resistant to marine borers	
			F Western Red Cedar	Cultivated in UK		3(1)								
			E Western Red Cedar											
			E Western Red Cedar											
			E Western Red Cedar											
28	Taxus occidentalis (Mill.) Mill.		E Western White Cedar	Canada	430-500	0(1)	n/a	n/a	n/a	n/a	n/a	n/a		
			F Western White Cedar											
			E Western White Cedar											
			E Western White Cedar											
29	Taxus heterophylla (Mill.) C.B. Cl.		E Western Hemlock	N America	430-500	4	0	0	0	1	1	3		
			F Western Hemlock	Cultivated in Europe						2	2			
			E Western Hemlock											
			E Western Hemlock											

Table B.2—Durability and treatability of temperate hardwood species

No	Scientific name	Code acc. to EN 15357	Common name	Origin	Density/ kg/m ³ at 12 % MC	Durability of heartwood			Treatability		Additional data: information stored available	
						Fungi	Archib. r.	Tartrate S.	Heartwood	Sapwood		
1	<i>Alnus pseud-plicatus</i> L. <i>Alnus plicatus</i> L.	AL-S AL	European Alder European Alder	Europe (Israel)	610-640-680	3	3	3	1	1	3	Not resistant to machine borers
2	<i>Aspenus hirsutus</i> L.	AS-F	European Horse-chestnut	Europe	500-540-580	3	3	3	1	1	3	
3	<i>Alnus glutinosa</i> (L.) Mill. <i>Alnus glutinosa</i> (L.) Mill.	AL-F AL	Alder European Alder	Europe (for AL glutinosa)	500-550-580	3	3	3	1	1	3	
4	<i>Betula alleghaniensis</i> Brit. <i>Betula alleghaniensis</i> (Michx. f.)	BE-F BE	European Birch European Birch	Europe	550-600-700	3	3	3	1-2	1-2	3	
5	<i>Betula pendula</i> Roth.	BE-F	European Birch	Europe	550-600-700	3	3	3	1-2	1-2	3	

N°	Scientific name	Code area to 23-55 35	Common name	Origin	Density/ kg/m ³ at 12% MC	Durability of heartwood			Fireability		Sap wood width	Additional data/ information when available	
						Fungi	Antibio a	Ferrite b	Heat wood d	Sag wood			
B-Papilionifera													
5	<i>Botanomyces</i> L. <i>pendula</i> Roth	000-10 23-55 35	European Birch B-Boulean B-Boulean B-Boulean	Europe	650-690- 690	3	0	3	1-2	3			
7	<i>Corpus betulus</i> L.	000-10 23-55 35	European Birch B-Boulean B-Boulean	Europe	700-800- 800	3	c/a	3	1	3			
8	<i>Corpus alba</i> Willd. Sweet <i>Corpus alba</i> Willd. K. Koch <i>C. torquosa</i> L.	000-10 23-55 35	European Birch B-Boulean B-Boulean B-Boulean	Europe	700-800- 800	4	c/a	3	2	3			
9	<i>Castanea sativa</i> Mill.	000-10 23-55 35	European Chestnut B-Boulean B-Boulean	Europe	600-650- 650	3 (f)	0	3	2	3	Sapwood resistant Trichofacts Insects Kiln-drying and fireability		
10	<i>Cedrus</i> sp. <i>C. deodara</i> G. Don <i>C. libani</i> Mill. <i>C. libani</i> Mill.	000-10 23-55 35	European Cedar B-Boulean B-Boulean B-Boulean	Europe	450-490- 490	3	c/a	3	1-2	3			
11	<i>Eucalyptus</i> L. <i>globulus</i> Mill. <i>globulus</i> Mill.	000-10 23-55 35	European Eucalyptus B-Boulean B-Boulean	Europe	700-800- 800	3	c/a	3	3	3			



N°	Scientific name	Code acc.to EN 13056	Common name	Origin	Density/ kg/m ³ at 12 % MC	Durability of heartwood			Resistance		Additional data/ information when available
						Fungi	Insects	Termites	Mean wood density	Sapwood width	
12	<i>Eucalyptus grandis</i> Hill. ex Gold.		Spain	Galicia	350-390-400	0	0	0	c/a	c/a	
			France	Alsace	350-400	0	0	0	c/a	c/a	
			Italy	Liguria	350-400	0	0	0	c/a	c/a	
			Argentina	Patagonia	350-400	0	0	0	c/a	c/a	
13	<i>Eucalyptus saligna</i> Sm. ENL		Australia	Victoria	350-400	0	0	0	c/a	c/a	
			France	Alsace	350-400	0	0	0	c/a	c/a	
			Italy	Liguria	350-400	0	0	0	c/a	c/a	
			Argentina	Patagonia	350-400	0	0	0	c/a	c/a	
14	<i>Eucalyptus marginata</i> Sm.		Australia	Queensland	350-400	0	0	0	c/a	c/a	
			France	Alsace	350-400	0	0	0	c/a	c/a	
15	<i>Eucalyptus nitens</i> Sm.		Australia	Queensland	350-400	0	0	0	c/a	c/a	
			France	Alsace	350-400	0	0	0	c/a	c/a	
16	<i>Eucalyptus globulus</i> Labillard.		France	Alsace	350-400	0	0	0	c/a	c/a	
			Italy	Liguria	350-400	0	0	0	c/a	c/a	
			Argentina	Patagonia	350-400	0	0	0	c/a	c/a	
			France	Alsace	350-400	0	0	0	c/a	c/a	

N°	Scientific name	Code	Common name	Origin	Density/ kg/m ³ at 12 % MC	Durability of heartwood		Fungal decay		Resistance to		Sapwood width	Additional data/ information when available
						Class	Mean value	Class	Mean value	Heartwood	Sapwood		
1	<i>L.</i>		Advanced Fungicide Penetration			1							
22	<i>Pinus sylvestris</i> L.	PLSY	European Spruce	Europe		4	n/a			n/a	n/a	n/a	
23	<i>Keteleeria pinnatifida</i> (Lam.)	KPPN	Chinese Fir	Asia	300-400	3	n/a			n/a	1	n/a	
24	<i>Parlatia</i> sp.		Chinese Fir	Europe		3	n/a			n/a	n/a	n/a	Not resistant to marine borers
25	<i>Platanus x hispanica</i> (Lam.)	PLHI	European Plane	Europe		3	n/a			n/a	n/a	n/a	Not resistant to marine borers
26	<i>Pinus densata</i> (Lam.)	PDDN	Chinese Fir	Europe	400-450	3	n/a			n/a	1	n/a	Not resistant to marine borers
27	<i>Pinus densata</i> L.	PDDN	Chinese Fir	Europe		3-5	n/a			n/a	n/a	n/a	Not resistant to marine borers
28	<i>Pinus densata</i> L.	PDDN	Chinese Fir	Europe		4	n/a			n/a	n/a	n/a	Not resistant to marine borers

N°	Scientific name	Code	Common name	Origin	Density/ kg/dm ³ at 12 % MC	Durability of heartwood		Treatability		Sap wood width	Additional data/ information when available
						Fungal attack	Termit resistance	Heart wood	Sap wood		
2. • Quercus subgenus Quercus											
25	Quercus alba L. Q. petraea L. Q. lyrata Walt. Q. michauxii Nutt. Q. sp. n.	Q25	Q. americana white oak Q. chêne blanc Q. américaine Damenkanische Eiche	North America	670-730- 730 630	2-3 03	0	4	2	3	Sapwood not resistant to Lyctus
26	Quercus cerris L.	Q26	Q. Turkey Oak Q. chêne cerise Eberesche	Europe	710-730- 830	3	0/2	4	1	3	Sapwood not resistant to Tricheterus bicoloratus
27	Quercus edulis L. Q. petraea Walt. (L.)	Q27	Q. European Oak Q. chêne rouge Eiche	Europe	650-670- 710-730	2-3 0/2	0	4	1	3	Sapwood not resistant to Lyctus and Tricheterus bicoloratus This species exhibits a wide range of durability fungi were tested in the same conditions
28	Quercus robur L. Q. laevis Mill. Q. alvarius Buck Q. sp. n.	Q28	Q. americana red oak Q. chêne rouge Q. américaine Damenkanische Eiche	North America	650-700- 730 630	2-3 03	0	4	1	3	Sapwood resistant to Lyctus

Table B.3—Durability and treatability of tropical hardwood species

No	Scientific name	Code acc. to EN ISO 16	Common name	Origin	Density/ ³ kg/m ³ at 1200C	Durability of hardwood			Treatability		Additional data/ ³ information available
						Fung	Beetle	Term	Heart	Sap	
								ites	wood	wood	
1	<i>Albizia nigrescens</i> C.Liv.		Yakoune	SE Africa (Zimbabwe)	830-850-930	1	n/a	0	2	2	S
2	<i>Albizia</i> spp. <i>Albizia littoralis</i> A.Dum. <i>Albizia</i> Willd.		Yakoune	SE Asia	400-500-600	3-4	3	3	3	n/a	
3	<i>Afzelia</i> spp. p.p. <i>Afzelia</i> Hance <i>A. buxifolia</i> Hance <i>A. parvifolia</i> Hance <i>A. quinquensis</i> J.E.S. <i>Afzelia</i> Lourensis C.Liv.	AFZ	Yakoune E-Mbaelle E-Bessie E-Mbaelle	SE Africa	750-800-850	1	0	0	2	2	S
4	<i>Afzelia</i> spp. p.p. <i>A. meridionalis</i> S.Vidal <i>A. xylocarpa</i> Griseb <i>Euclea</i> bujaga (Coccolob. Hance) <i>E. palauensis</i> Hance <i>Euclea</i> sp. pl.	AFZ	Yakoune Mbaelle	SE Asia Australia	750-800-850	1-2 (1)	n/a	0	2	2	r
5	<i>A. buxifolia</i> spp. p.p. <i>A. meridionalis</i> Griseb.	AFZ	Yakoune	SE Africa	300-400-600	2	0	0	3	3	s

N	Scientific name	Code according to EN 135 26	Common name	Origin	Density/ kg/m ³ at 12 °C	Durability:cheatwood				Creatability		Sap wood width	Additional detail information when available
						Fung	Beetle	Term	Marine	Heart	Sap		
	<i>A. actinostroma</i> Hems. <i>A. feruginea</i> Berl. <i>A. glabrata</i> Berl. <i>A. versicolor</i> Berk.												
6	<i>A. durum</i> <i>occidentis</i> A.C. Smith	ADP	Edengetine	S America	350-650-670	3	S	S	S	2	2	2	
7	<i>A. pilosus</i> sp. <i>A. pterocarpoides</i> Hems. <i>A. feruginea</i> Pellegr. <i>A. pilosus</i> sp.	APPT	Alari Carthina Zolati	7 Africa	750-750-770	3	n/a	S	S	4	4	4	
8	<i>A. durum</i> <i>durum</i> J.B. Macq.	ADP	Edengetine	S America	700-850-900	3	D	N	D	3	3	3	
9	<i>A. pilosus</i> sp. <i>A. durum</i> <i>durum</i> J.B. Macq.	ADP	Edengetine	S America	800-850-1000	1	D	N	D	3	3	3	
10	<i>A. durum</i> sp. <i>A. feruginea</i> Berl. <i>A. glabrata</i> Berl. <i>A. versicolor</i> Berk.	ADP	Edengetine	S America	650-850-900	1	n/a	D	n/a	4	4	4	
11	<i>A. durum</i> <i>durum</i> J.B. Macq.	ADP	Edengetine	S America	850-850-1000	1	D	D	D	3	3	3	
12	<i>A. durum</i> <i>durum</i> J.B. Macq.	ADP	Edengetine	S America	700-850-	1	D	D	D	3	3	3	

N°	Scientific name	Code	Common name	Origin	Density/ kg/m ³ at 1200C	Durability:heartwood				Sap wood width	Additional detail information when available
						Fung 1	Boyle S	Term uses bores	Heart wood		
			Citragesso		800						
13	Mitoseptera sp.	AM0	Amorseo, Catalak	SE Asia	590-630- 740	4	S	S	3-4	r/g	S
14	Artianisoxantharia (Pers.) J.T.D. Lesch.	AM1	Amor, Bantians Bantians	SE Asia	490-490- 490	3	S	S	1	1	S No resistan- to termites
15	Aspidosperma sp. Aspidosperma F.Muell	AM2	Amorbo, Amor, S. America	S. America	650-750- 850	3	n/a	S	n/a	3	S
16	Acumera klansana Pierre J.M.L. Acumera	AM3	Amorbo, Amorbo, Bantians	S. America	490-490- 490	4-5	E	S	3	r/g	S
17	Acumera klansana Pierre J.M.L. Acumera	AM4	Amorbo, Amorbo, Bantians	S. America	750-850- 850	1	E	P	3-4	r/g	S No resistan- to termites and Lab
18	Edogonia fistuloides J.E. S.M. Edogonia and P. ensana	AM5	Amorbo, Amor, S. America	S. America	500-1050- 1100	1	E	P	3	1	S
19	Edogonia fistuloides J.E. S.M. Edogonia	AM6	Amorbo, Amor, S. America	S. America	850-910- 950	1	n/a	S	n/a	3	S
20	Edogonia fistuloides J.E. S.M. Edogonia	AM7	Amorbo, Amor, S. America	S. America	650-650- 650	3-4	E	S	3	1	S

No	Scientific name	Code acc. to D. H. 56	Common name	Origin	Density/ kg/m ³ at 12 °C	Durability of hardwood				Treatability		Additional data/ information etc. available
						Fung res.	Beetle res.	Term mites	Marine borers	Heart wood	Sap wood	
	<i>Acroshodon Gilliamii</i> <i>Agavea laurifolia</i> <i>Agavea mini</i> W. G. <i>Aspidose curat</i>											
20	<i>Ceanothus saccinifolius</i> (R. & S.) Engl.	CR2	Malaya East African Guianan Philippine	S.E. Africa	490-500- 550	+	n/a	+	n/a	+	+	Resistant to Lectus
22	<i>Ceanothus</i> sp. <i>C. bachelieri</i> Bur. <i>C. strictus</i> Bur. <i>Diospyros rosacea</i> H. J. Lam. <i>Carapa</i> sp. <i>Peccaria</i> sp. <i>Saccharum</i> sp.		Malayans	SE Asia	500-650- 750	+	+	+	+	+	+	
23	<i>Carya guianensis</i> Aubl. <i>Agavea</i> sp. <i>Carapa</i> sp.	CR2	Malayans	US America	600-650- 680	3-4	+	+	+	+	+	
24	<i>Caryocarpus glauca</i> Pers. <i>Agavea</i> sp. <i>Carapa</i> sp.	CR2	Malayans Philippine	S America	700-800- 950	+	+	+	n/a	+	+	
25	<i>Calophyllum laurifolium</i> (R. & S.) <i>Calophyllum</i> sp.	CR2	Malayans Philippine Indonesian	S America	800-850- 950	+	+	+	+	+	+	

N°	Scientific name	Code acc. to EN 13056	Common name	Origin	Density/ kg/m ³ at 12 °C	Durability of hardwood			Fireability		Additional data, information available
						fungi	Beetle	Termites	Heat-treated wood	Sec width	
	<i>Carrizobona</i> Arnald.										
31	<i>Cordia</i> spp. (C. alliodora DC C. alliodora DC C. guianensis L. C. guianensis L. C. sebestena L.		Guaranae	S America	800-850-950	1	0	U	1	2	S
32	<i>Cordia alliodora</i> (Bula and Cuzc) Pan. Jekel		Guaranae Light cordia	S America	850-890-950	2	0	U	1	3	S
33	<i>Cordia</i> spp. C. alliodora DC C. guianensis L. C. guianensis L. C. guianensis L.	CM3	Guaranae Light cordia Light cordia Light cordia Light cordia	S America	850-890-950	2	0	U	1	3	S
34	<i>Cordia</i> spp. (C. alliodora DC C. alliodora DC C. guianensis L. C. guianensis L.)		Guaranae	S America	850-890-950	1	0	B	3	3/4	S
35	<i>Cordia</i> spp. C. alliodora DC C. guianensis L. C. guianensis L. C. guianensis L.	CM3	Guaranae Light cordia Light cordia Light cordia	S America	850-890-950	2	0	S	1	3/4	

N°	Scientific name	Code acc. to EN 14536	Common name	Origin	Density kg/m ³ at 12 °C	Durability of hardwood			Treatability		Additional data, information when available
						Boiling water	Termites	Marine borers	Heart Rot	Sap wood	
	<i>Adiantum</i> L.										
35	<i>Adiantum album</i> L.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
36	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1-5	0	0	1	2	
37	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1-5	0	0	1	2	
38	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
39	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
40	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
41	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
42	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
43	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
44	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	
45	<i>Adiantum</i> sp.	EN 14536	Adiantum	Adiantum	400-450-500	1	0	0	1	2	

N°	Scientific name	Code according to EN 505	Common name	Origin	Density, kg/m ³ at 1250C	Durability of the wood			Treatability		Additional data/information when available
						Fung	Insect	Marine borers	Heartwood	Softwood	
	<i>Acacia saligna</i>		Acacia		720						
49	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	640-830-720	3	0	3	3	3	3
50	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	530-640-670	3-3	0	3	3	3	3
51	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	830-920-930	1	0	3	3	3	3
52	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	720-730-820	3	3	3	3-4	3	3
53	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	830-920-1200	1	0	3-4	3	3	3
54	<i>Entandribrachya cylindrica</i> Sprague		Acacia saligna	SE Asia	720-730-730	2-2	0	3	n/a	n/a	n/a
55	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	830-920-920	2	0	3	3	3	3
56	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	720-920-930	1	0	3-4	3	3	3
57	<i>Entandribrachya cylindrica</i> Sprague	2627	Acacia saligna	SE Asia	630-830-730	3-4	0	3	3-4	3	3

N°	Scientific name	Site acc. to EN 15356	Common name	Origin	Density kg/m³ at 12 °C	Durability of heartwood		Treatability		Sapwood width	Additional data/information when available
						Fungi	Beetle S	Termite borers	Heartwood	Sapwood	
			Frangui		920						
24	<i>Carex</i> sp. p. p. <i>C. cedrata</i> Pellegr. <i>C. laurentii</i> de Vlod.	1025	M. Bessé eladr de Gauron	S. Africa	570-580-610	2c	0	S	4	1	r
25	<i>Carex thymoides</i> Sprengel	1011	M. Bessé forest	S. Africa	620-630-820	2	2/3	S	4	1	r
26	<i>Guibourtia arborescens</i> J. Léonard	1109	M. Qu. Lomé	S. Africa	720-820-850	3	0	4-6	S	2	S
27	<i>Guibourtia</i> sp. p. p. <i>G. densa</i> J. Léonard <i>G. pallegondiana</i> J. Léonard <i>G. tassiniana</i> J. Léonard	1025	M. B. Binga	S. Africa	720-820-920	2	0	0	3-4	1	S
28	<i>Guibourtia densa</i> J. Léonard	1011	M. O. Agbo de Gauron	S. Africa	720-780-820	2	0	0	S	1	r
29	<i>Hemitelia</i> sp. <i>H. heptaphelloides</i> Womers. <i>H. imperiginosa</i> Matis <i>H. sennarum</i> J. de S. G. Gress.	1025	M. Lige F. de G. Gress	S. America	900-1000-1200	1	0	0	0	10/3	S-r
30	<i>Hemitelia</i> sp. p. p. <i>H. javanica</i> Bostart. <i>H. singulifolia</i> Kosterm. <i>H. sennarum</i> Kosterm.	1021	M. Mengkalang	SE Asia	650-710-720	3	0	S	S	2	S

N°	Scientific name	Code acc. to EN 15356	Country	Origin	Density/ kg/m³ at 12 °C	Durability of hardwood				Treatability		Additional data/ information when available
						fungi	beetle	termite	marine borers	heart rot	sapwood	
72	<i>Heterocera</i> spp. <i>H. densiflora</i> Sostera <i>H. nigriventris</i>	EFB	Si Vietnam	N Africa	870-880- 910	3	0	3-4	3	4	3	0
73	<i>Heterocera</i> spp. <i>H. curvipes</i> L. <i>H. intermedia</i> Janka <i>H. albicollis</i> Janka	EFB	Si Vietnam	S America	900-950- 1050	2-3	0	3-4	3	4	3-4	0
74	<i>Curia curvipes</i> Janka	EFB	Si Vietnam	N Africa Mediterranean	900-950- 950	3(2)- 4(3)	n/a	3	n/a	3	2	0
75	<i>Ju. bernardina</i> Pellegriniana Trappin		Si Vietnam	N Africa	900-950- 950	3	0	3-4	3	3	n/a	0
76	<i>Eupia</i> spp. a.E. <i>acanthodes</i> C.OC. b.E. <i>grandis</i> C.OC. a.E. <i>isuridis</i> A.Ces. a.E. <i>suragularis</i> A. Juss.	EFB	Si Vietnam N Africa Mediterranean Mediterranean Mediterranean Mediterranean	N Africa	a. 940- 950-990 b. 930-950- 950	3	0	3	3	4	2	0
77	<i>E. nardus</i> gahamensis Perris		Si Vietnam	N Africa	1000- 1050-1150	1	0	0	3	3	n/a	n/a
78	<i>Eupia</i> <i>nardus</i> gahamensis Perris		Si Vietnam	SE Asia	950-960- 980	2	0	3	3	3	1-2	0

N°	Scientific name	Code acc. to D. 113 52	Common name	Origin	Density/ kg/m³ at 1200°C	Durability of heartwood			Treatability		Additional data, information etc. available
						Long	Beetle	Termites	Heart wood	Sap wood	
					550						
88	<i>Acidilobus</i> sp. <i>A. laticornis</i> Ten. <i>A. ovalis</i> Carb.	W330	Acidilobus	S America	500-550-550	1	0	0	4	r/g	S
89	<i>A. laticornis</i> sp. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten.	W330	Acidilobus	S America	500-550-550	4	5	8-9	4	r/g	
90	<i>A. laticornis</i> sp. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten.	W330	Acidilobus	S America	500-550-550	1-2	0	0	4	1	Sapwood not resistant to termites. No resistance under lab conditions.
91	<i>A. laticornis</i> sp. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten.	W330	Acidilobus	S America	500-550-550	2	0	0	4	r/g	S
92	<i>A. laticornis</i> sp. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten.	W330	Acidilobus	S America	500-550-550	1	0	0	3	r/g	r/g
93	<i>A. laticornis</i> sp. <i>A. laticornis</i> Ten. <i>A. laticornis</i> Ten.	W330	Acidilobus	S America	500-550-550	1	0	0	3	r/g	r/g

N°	Scientific name	Site acc. to EN 13558	Common name	Origin	Density (kg/m³) at 12 °C	Durability of heartwood				Treatability		Additional data, information available
						fungi	Beetles	Termites	Marine borers	Easy wood	Sap wood	
					550							
91	Raulana ssp. R. dederichii Mart. R. gallica Karst. R. xanthoxylon Burdet.	Valais	St. R. Lange Ecluse St. Rade	S. Africa	750-750-780	1	1/2	0	1-4	3	1	3% resistant to termites under lab conditions
92	Kasaporia ssp. K. fonscolombei Capuron K. lapinae Capuron K. guineensis (A. Chev.) Capuron	Guinea	St. Kadié St. Benta	NW Africa	710-730-760	3	0	1-4	3	3-6	1-2	3
93	Arboreofagus alpinus Germ. f. Reticofagus Germ. and Engl. f. Germ.	Guinea	St. Pauli	S. America	830-880-910	4	1/2	3	1/2	2	2	3
94	Reticofagus Germ. f. Germ.	Guinea	St. Lomas	S. America	830-880-910	3	1/2	3	1/2	4	1/2	3
95	Unguicula Germ. f. Germ.	Guinea	St. Lomas	NW Africa	800-840-880	2	0	0	3	3	1/2	3
96	Arboreofagus Germ. f. Germ.	Guinea	St. Lomas	S. America	890-910-950	3	0	2	3	3-6	1	3
97	Pallidifagus Germ. f. Germ.	Guinea	St. Lomas	US America	830-860-880	2-3	0	0	3	4	1	3

N°	Scientific name	Code according to EN 13353	Common name	Origin	Density/ kg/m³ at 120°C	Durability of heartwood				Treatability		Sapwood width	Additional data/information when available
						Fungi	Beetles	Termites	Marine borers	Heartwood	Sapwood		
	<i>P. vanuxemi</i> Benth.												
99	<i>Pericopsis angolensis</i> Deeken		Domonga	SE Africa (Mozambique, Angola, RSA)	810-910-930	1	r/e	2	r/e	3	2	3	
100	<i>Pericopsis elata</i> Seawen	PSE	Malfrumata	SE Africa	680-880-710	1-2	0	3	3-4	4	1	2-3	
101	<i>P. prateniensis</i> africana (LAF) Bena	PLAF	Malfrumata	SE Africa	670-700-920	3 (2)	0	3	3	3	n/a	n/a	
102	<i>Pocotia pinnata</i> (L.) Forst. (LAF) and L. Forst.	PLF	SE Asia, Oceania	SE Asia, Australia	630-710-730	3 (2)	3	4	3	3-4	2	4	
103	<i>Pseudobalanosyris rufonervella</i> Bae		SE Africa	SE Africa (Mozambique)	1100-1160-1150	1	r/e	2	r/e	4	2	3	
104	<i>Serrosimonia palustris</i> Springen <i>S. nana</i> sp. <i>S. laticeps</i> Baker <i>S. africana</i> Tjijst. <i>S. africana</i> sp. <i>S. africana</i> Baker	SDSP	SE Asia	SE Asia	630-920-670	2	r/e	3	r/e	4	2	4	
105	<i>Pericopsis</i> hybridized		SE Africa	SE Africa	730-910-	2	0	3	4	2-3	n/a	4	

N°	Scientific name	Site acc. to EN 15552	Common name	Origin	Density/ kg/m³ at 25°C	Durability offshore			Treatability		Additional data/ information when available
						Fungi	Beetles	Termites	Marine borers	Easy wood	Sealant
	Ullibru <i>Pyrenopeziza</i> Engl.				920						
105	<i>Pterocarpus</i> sp. <i>P. europaeus</i> <i>P. africanus</i> f. ab. <i>P. africanus</i> f. ab. <i>P. africanus</i> f. ab.	EUROPE AFRICA	Redwood African African African African	Europe Africa Africa Africa Africa	730-740- 820	1 1 1 1 1	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	Not resistant to termites under lab conditions
106	<i>Pterocarpus erinaceus</i> Poir.		Europe	Europe	830-900- 930	1	0	0	0	0	0
108	<i>Pterocarpus erinaceus</i> L. Schum. <i>P. baobab</i> De Kalk.	EUROPE	Europe African African	Europe Africa Africa	510-520- 610	5	0/4	0	0/4	1	0
109	<i>Pterocarpus erinaceus</i> Poir.	EUROPE	Europe	Europe	640-650- 660	5	0	0	0	1	0
110	<i>Pterocarpus</i> sp. <i>P. erinaceus</i> Aubl. <i>P. erinaceus</i> f. ab. <i>P. erinaceus</i> f. ab. <i>P. erinaceus</i> f. ab. <i>P. erinaceus</i> f. ab.	EUROPE	Europe African African African African	Europe Africa Africa Africa Africa	630-730- 830	3 3 3 3 3	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	Not resistant to termites under lab conditions

N°	Scientific name	Code acc. to EN 135 EV 135 36	Common name	Origin	Density/ kg/m³ at 13 °C	Durability:chewwood			Creatability		Sap wood width	Additional data/ information when available
						Prog	Beetle S	Cem	Use:ins	Exact Wood		
III	<i>R. albiflora</i> (Gert. - Bert.) <i>R. alba</i> (L.) Gert. - Bert.											
	<i>Pinus apulica</i> sp.	PHX	St. Andrew	SE Asia	470-480-490	3	B	S	S	1	b	
	<i>R. bresinensis</i> Gert. - Bert. <i>S. securatifolia</i> Rabenh.											
III	<i>Saxonia rupestris</i> var. <i>alba</i> Kunt.	COB	Saxonia ventral	S America	500-520-530	2	B	D	D	4	e	
	<i>Galea Saxonia rubra</i>											
III	<i>Saxonia</i> sp. <i>saxonia</i> SHL <i>Erasmia</i> <i>Saxonia King</i> <i>S. laevis</i> Gill. <i>Saxonia King</i> <i>S. saxonia</i> King <i>S. saxonia</i> King	SHL	Saxonia ventral	SE Asia	500-520-530	2	B	D	D	4	s	Red resin and to termites under field conditions
III	<i>Saxonia</i> sp. <i>alba</i> SHL <i>Erasmia</i> sp.	SHL	Saxonia ventral	SE Asia	550-580-590	3-4	S	S-4	S	4+	s	
	<i>Saxonia</i> sp. <i>alba</i> SHL <i>Erasmia</i> sp.	SHL	Saxonia ventral	SE Asia	550-580-590	3-4	S	S-4	S	4+	s	
	<i>Saxonia</i> sp. <i>alba</i> SHL <i>Erasmia</i> sp.	SHL	Saxonia ventral	SE Asia	550-580-590	3-4	S	S-4	S	4+	s	
III	<i>Saxonia</i> sp. <i>alba</i> SHL <i>Erasmia</i> sp.	SHL	Saxonia ventral	SE Asia	550-580-590	3-4	S	S-4	S	4+	s	
	<i>Saxonia</i> sp. <i>alba</i> SHL <i>Erasmia</i> sp.	SHL	Saxonia ventral	SE Asia	550-580-590	3-4	S	S-4	S	4+	s	
	<i>Saxonia</i> sp. <i>alba</i> SHL <i>Erasmia</i> sp.	SHL	Saxonia ventral	SE Asia	550-580-590	3-4	S	S-4	S	4+	s	

N	Scientific name	Code according to DA 131 SE	Common name	Origin	Density/ kg/m ³ at 1240C	Durability of heartwood			Treatability		Additional data, information not available
						Fung class	Beetle class	Termite borers	Heart wood	Sap wood	
Part 1											
120	<i>Strombosia appendiculata</i> E. Schum.		004011	El Salvador, Honduras, etc.	350-350-360	2	n/a	3	1	2	
121	<i>Strombosia rubroperata</i> E. Schum.		004026	El Salvador	350-350-360	2	2	3-4	2	n/a	3
122	<i>Swietenia</i> sp. pl. <i>Swietenia macrophylla</i> König <i>Swietenia macrophylla</i> König <i>Swietenia macrophylla</i> König <i>Swietenia macrophylla</i> König <i>Swietenia macrophylla</i> König	3602	004027 004028 004029 004030 004031 004032	Costa Rica	310-350-390 300-320-340	2	2	3	4	3-4	3
123	<i>Tectona grandis</i> L.f.	1001	004033	Asia	350-380-390	1-2 (C)	2	4	4	2	3
124	<i>Terminalia ivorensis</i> A. Chev.	2017	004034	Cultivated in Africa	350-380-390	3	2	4	4	2	3
125	<i>Terminalia superba</i> (R. & P.) Benth. and Benth.	2018	004035	Africa	350-380-390	4	3	3	2	1	(n) % resistant to rot

N°	Scientific name	Code according to EN 13526	Common name	Origin	Density/ kg/m³ at 120°C	Decubility of hardwood			Treatability		Additional data/ information when available
						Fungus	Beetle	Termite	Heart Wood	Sap wood	
126	<i>Lasius piceus</i>	126B	W. bumble	Africa		2-3 (0)	0	0	0	1	Not resistant to termites under test conditions
127	<i>Diaperella berkelei</i> Pierre et A. Chev.	127B	W. bumble	Africa	320-360-400	0	0	0	4	0	
128	<i>Diaperella africana</i> (Forsk.) sp. (Kilgus sp.)	128F	W. bumble	Africa	320-360-400	0	0	0	4	0	
129	<i>Emphidon schweyleri</i> E. Schenck	129B	W. bumble F: Scarab/Beetle W. bumble W. bumble	Galicia	370-390-400	0 (0)	0	0	0	1	Not resistant to termites under test conditions
130	<i>Tricardius africanus</i> Palleg.	130F	W. bumble	Africa	340-350-360	4	0	0	4	0	Not resistant to termites
131	<i>Diaperella</i> sp. <i>Diaperella</i> sp. <i>Diaperella</i> sp. <i>Diaperella</i> sp. <i>Diaperella</i> sp.	131B	W. bumble F: Light Wood W. bumble	Maraca	400-440-480	0	0	0	1-2	0	Not resistant to termites

N°	Scientific name	Code acc. to EN 13353	Common name	Origin	Density/ kg/m ³ at 12 %MC	Durability of heartwood		Treatability		Additional data/ information when available
						Fungus	Beetle	Heartwood	Sapwood	
122	<i>Conocarpus americanus</i> subsp. <i>macgregoriae</i> Sandw.		Manzanillo	S America	800-900-1000	1	1	3	1/2	3
123	<i>Coccoloba</i> sp. <i>C. brasiliensis</i> Standl. <i>C. maxima</i> Boiss <i>C. monilosa</i> DC.	123	Guamaba	Caribbean	450-550-650	4	3	2	2	3
124	<i>Zamia</i> L.f. <i>heisteria</i> B.S. <i>gabrielii</i>		Yolofa	S Africa	500-550-650	3	3	2-3	2-3	3

For commercial purposes timbers which are of different species are sometimes grouped together and sold under a single name. These groups of species will not behave in the same way as a clearly defined single species. With respect to durability and treatability the following table shows the lowest, durability, and the highest, resistance to preservative treatment, normal found in species within the group. The species showing lowest durability is often not the same as the species showing the greatest resistance to treatment. Treatment for the most resistant species may result in over-treatment of more permeable species within the group.

Table B.1—Classification of commercial groupings

Grouping name	Scientific name of wood species groups	Origin	Durability of heartwood				Resistance	
			Fungal	Hydrolytic types	Acidic types	Chemical types	Heartwood	Softwood
Douglas Fir/Larch	Pseudotsuga menziesii (Mill.) B.S.P. and Larix laricina (DuRoi) Koch	Canada and USA	3	E	E	S	4	3
European Larch	Picea abies (L.) Mill.	Europe	4	S	S	S	3-4	3
Picea sp. 2-4	Picea abies (L.) Mill.	C. Europe	4	S	S	S	3-4	3
Black Fir	Isopachys abies (L.) Mill.	Canada and USA	4	S	S	S	3	3
Kiefernzirke	Picea abies (L.) Mill.	C. Europe	3-4	E	E	S	4	3-4
Scots Pine/Fir (S.P.F.)	Picea abies (L.) Mill.	Canada	4	S	S	S	3-4	3-4
Western Larch	Picea abies (L.) Mill.	USA	4	S	S	S	3-4	3-4

1. To Scandinavia this term refers to spruce alone.

Annex C (informative)

Classification of treatability with aqueous wood preservatives

Treatability is the ease with which a wood can be penetrated by a liquid applied during a process of wood impregnation. Depending on the formulation, the achieved penetration may be different.

The biological durability and the treatability of sapwood and heartwood are usually different with higher durability in the heartwood and better treatability in the sapwood. If the heartwood and sapwood cannot be distinguished, the component shall be regarded as being composed entirely of sapwood if its durability is being considered, and as being composed entirely of heartwood, if its treatability is being considered (worst case scenario).

When a laboratory test is used to determine the treatability class, the value to be reported in Annex B is an average of the individual values. Where significant variability is observed, the average value should be written followed by a "v" (i.e. 3v).

There is no standardized European protocol allowing defining treatability.

Table C.1 provides a set of broad descriptions for classifying treatability based on general observations associated with vacuum/pressure treatment processes. A four class system is used.

The treatability classes cannot be separated exactly from each other; this applies particularly to the treatability classes 2 and 3. Wood species assigned to these treatability classes often show very irregular penetration.

NOTE 1 CEN/TR 14734 describes a method for the assessment of treatability classes for preservative-treated wood.

NOTE 2 Information on treatability is included to assist in the interpretation of EN 351-1.

Table C.1—Classification of the treatability of wood

Treatability class	Description	Explanation
1	Easy to treat	Easy to treat;sawn timber can be penetrated completely by pressure treatment
2	Moderately easy to treat	Fairly easy to treat;usually,complete penetration is not possible,but after 3 h or 4 h by pressure treatment more than 6 mm lateral penetration can be reached in softwoods and in hardwoods a large proportion of the vessels will be penetrated
3	Difficult to treat	Difficult to treat;3 h to 4 h by pressure treatment may not result in more than 3 mm to 6 mm lateral penetration
4	Extremely difficult to treat	Virtually impervious to treatment; littlepreservative absorbed even after 3 h to 4 h by pressure treatment;both lateral and longitudinal penetration minimal
a Historically treatability data may use other descriptive terms which approximate to the treatability classes as follows: class 1 permeable class 2 moderately resistant class 3 resistant class 4 extremely resistant		

Classification of permeability to water

The use of replicate specimens is a requirement in all test methods.

Annex E (informative)

Testing durability to disfiguring fungi

E.1 General

Wood-disfiguring fungi (sapstain and moulds) are of economic importance as they affect the aesthetic appearance of wood and wood-based materials in service.

These organisms normally have no significant effect on the mechanical resistance of wood.

Durability against blue stain varies between wood species.

Susceptibility to mould growth depends less on the wood species and is more related to environmental factors such as condensation, moisture.

E.2 Testing durability to disfiguring fungi

The test method described in the standard EN 152, which provides a basis for assessment of the effectiveness of a wood preservative or wood preservative systems in preventing the development of blue stain fungi in wood in service where disfigurement can be considered important, such as external decorative timber and joinery, can serve as a basis for assessment of the biological durability against blue stain.

E.3 Classification of durability to disfiguring fungi

No scale is given to classify the durability of wood against disfiguring fungi because no standardized European protocol exists.

In the absence of data, the sapwood of all wood species is regarded as prone to be colonized by disfiguring fungi when moisture of the surface of wood is increased.

Very little data on the resistance of heartwood to the development of these organisms are available.

Available information has been included in Annex B, Tables B.1, B.2 and B.3.

Annex F (informative)

Classification of performance

F.1 General

Performance is the ability of a wood species or a wood-based material to withstand deterioration over time.

Performance can depend on a number of factors which will vary in importance depending on the end use.

Performance of wood in service is affected by the relative proportion of sapwood, transition wood and juvenile wood which can be present, as sapwood and heartwood generally have different levels of durability.

In many cases the ease with which a wood product becomes and remains wet can have a significant effect on performance, as it is the major factor controlling the possibility or not of fungal decay. For woods having the same durability against decay fungi, the performance in service is expected to be better for wood species with lower permeability to water.

Most notably in use class 3, the permeability of the material, the design of the component/structure to shed water and avoid water trapping, and in some cases the maintenance of a component or structure can all greatly improve the performance of wood in use.

Performance within a use class may vary with and even within geographical location. This can be due to a number of factors such as difference in biological hazard, climate, micro-climate etc.

F.2 Principles of the assessment of performance

Understanding the performance of wood in service is a combination of parameters fundamentally based on a combination of the durability class of the wood, its permeability to water and the availability of moisture in the end use application.

Performance can be determined either by an adequate set of laboratory tests including relevant ageing procedures or by field tests simulating in-service conditions. If field test data are available, they shall take precedence over the data from laboratory tests. If no data from field tests are available, a provisional classification using the data from laboratory tests is possible.

EN 252 standard provides a method which can be adapted to assess the performance of wood and wood-based materials to withstand bio-deterioration (decay fungi and subterranean termites) over time. At least 30 stakes of the test wood species or wood-based material shall be used in place of the impregnated test stakes described in that standard. Stakes of *Pinus sylvestris* sapwood and *Fagus sylvatica* (or any other non-resistant species) shall be used as references to measure termite activity of the field throughout the test. They shall be replaced as necessary when they fail. Comparison between the time before failure of the wood species or wood-based material under test and a reference wood species or material can be a possible assessment criterion.

However, no single reference test protocol has been designed so far.

F.3 Principles of the classification of performance

The durability tests enable a classification of performance against 'benchmark' materials that have been tested in the same way.

The results do not express an absolute value of service life, but they allow ranking performance of different wood and wood-based materials for a given test field and defined use class.

Annex G (informative)

Form to be used for the inclusion of new data on wood species /wood-based material

1-IDENTIFICATION OF THE PROPOSED MODIFICATION

Wood species	Matter of modification (Tick relevant boxes)
a) Scientific name)	Addition of wood species
b) Common name	Addition of wood-based material
c) Origin)	Modification of existing data ☐ (reference in EN 350)
	softwood ☐ /hardwood ☐
	Durability
	Proposal regarding natural durability to fungi based on laboratory test
	Basidiomycetes ☐ /Soft rot ☐
	Proposal regarding natural durability to fungi based on field test
	Proposal regarding natural durability to insects
	Hylotrupes ☐ /Anobium ☐ /Lyctus ☐
	Termites ☐ (please specify genus and species)
	Other ☐ (please specify genus and species)
	Proposal regarding natural durability to marine borers
	Treatability
	Density [
	Other

2-PROPOSAL

Use symbols and durability classes according to EN 350 test methods.

General information on the wood species			
Density kg/m ³		Range of mean values at 12 %mass fraction moisture content	
Durability			
Test organisms	Proposal for durability class	Test method used	Comments/Additional information
Durability to wood-decay fungi			
Basidiomycetes (i.e. Coniophora puteana) Soft rot Other: (i.e. combination of different species in case of field testing)		(i.e. CEN/TS 15083-1) (i.e. CEN/TS 15083-2) (i.e. EN 252, EN 330))	(i.e. field test located in Malaysia)
Durability to beetles			
Hylotrupes bajulus Anobium punctatum Lyctus sp Other: (i.e. Trichoferus holocericeus)		(i.e. EN 47) (i.e. EN 49-1) (i.e. EN 20-1) (i.e. EN 47)	
Durability to termites			
Reticulitermes (i.e. flavipes) Other: (i.e. Coptotermes gestroi) (i.e. combination of different species)		(i.e. EN117) (i.e. EN 252)	(i.e. at least two different species were recorded in the test field)
Durability to marine borers			
Limnoria sp. (i.e. quadripunctata) Other: (i.e. Teredo naavales)		(i.e. EN 275)	(i.e. marine trial test located in Portugal)
Treatability			
Treatability class	Heartwood		Sapwood width
	Sapwood		

3-INFORMATION ON DATA

— origin of the data:

i.e. Results obtained in the Project “X”, coordinated by “Y”

ie. Tests carried out in the following research laboratory(ies):

— modifications to the test methods used (EN, CEN/TS, CEN/TR, national standard, other protocols);

— are results available/published?;

— are some tests currently on progress?;

— documents attached.

4-ORIGIN OF INFORMATION

— name of proposer:

— company or organization

— e-mail:

5-COMMENTS

6-Place and Date

This form has to be sent to CEN/TC38 secretariat

Bibliography

- [1] *ISO 2859-2, Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*
- [2] *EN 351-1, Durability of wood and wood-based products - Preservative-treated solid wood - Part 1: Classification of preservative penetration and retention*
- [3] CITES, “Convention on International Trade in Endangered Species of Wild Fauna and Flora” signed at Washington DC on 3 March 1973 and published as a special supplement to IUCN Bulletin 4(3) March 1973. Amended at Bonn, on 22 June 1979
- [4] *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*
- [5] *EN 13556, Round and sawn timber - Nomenclature of timbers used in Europe*
- [6] CEN/TS 15679:2007, Thermal Modified Timber - Definitions and characteristics
- [7] *ISO 3129, Wood — Sampling methods and general requirements for physical and mechanical testing of small clear wood specimens*
- [8] HILL C.A.S. Wood Modification: Chemical, Thermal and Other Processes, 2006
- [9] *EN 330, Wood preservatives - Determination of the relative protective effectiveness of a wood preservative for use under a coating and exposed out-of-ground contact - Field test: L-joint method*
- [10] *EN 335, Durability of wood and wood-based products - Use classes: definitions, application to solid wood and wood-based products*
- [11] *EN 1001-2, Durability of wood and wood based products - Terminology - Part 2: Vocabulary*
- [12] *EN 15534-1, Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 1: Test methods for characterisation of compounds and products*
- [13] prEN 16818, Durability of wood and wood-based products - Moisture dynamics of wood and wood-based products³
- [14] *CEN/TS 1099, Plywood - Biological durability - Guidance for the assessment of plywood for use in different use classes*
- [15] *CEN/TR 14734, Durability of wood and wood-based products - Determination of treatability of timber species to be impregnated with wood preservatives - Laboratory method*
- [16] *EN 927-5, Paints and varnishes - Coating materials and coating systems for exterior wood - Part 5: Assessment of the liquid water permeability*
- [17] *EN ISO 535, Paper and board - Determination of water absorptiveness - Cobb method (ISO 535:2014)*

³In preparation.

British Standards Institution(BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit, or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than 1 device provided that it is accessible by the sole named user only and that only 1 copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced in any format to create an additional copy. This includes scanning of the document.

If you need more than 1 copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright & Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can ensure your documentation is current. For further information, email subscriptions@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision. We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services

Tel: +44 345 086 9001

Email (orders): orders@bsigroup.com

Email (enquiries): cservices@bsigroup.com

Subscriptions

Tel: +44 345 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W44AL UK