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**Biološka odpornost lesa in lesnih proizvodov - Preskušanje in razvrščanje  
odpornosti proti biološkim dejavnikom lesa in lesnih materialov**

Biological durability of wood and wood-based products - Testing and classification of the durability against biological agents of wood and wood-based materials

Biologische Dauerhaftigkeit von Holz und Holzprodukten - Prüfung und Klassifikation der Dauerhaftigkeit von Holz und holzbasierten Materialien gegenüber biologischem Angriff

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

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EUROPEAN STANDARD  
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**DRAFT**  
**prEN 350**

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**Biological durability of wood and wood-based products -  
Testing and classification of the durability against  
biological agents of wood and wood-based materials**

Durabilité biologique du bois et des matériaux à base  
de bois - Méthodes d'essai et de classification de la  
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Holzprodukten - Prüfung und Klassifikation der  
Dauerhaftigkeit von Holz und holzbasierten  
Materialien gegenüber biologischem Angriff

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 38.

If this draft becomes a European Standard, 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.

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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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## European foreword

This document (prEN 350:2026) has been prepared by Technical Committee CEN/TC 38 “Biological durability of wood and wood-based products”, the secretariat of which is held by SIS.

This document will supersede EN 350:2016.

This document is currently submitted to the CEN Enquiry.

This document includes the following significant technical changes with respect to EN 350:2016:

- Preservative treated wood is not in the scope of this document.
- Durability classes (DC), i.e. classes of durability against wood-destroying fungi, are newly defined, on the one hand with regard to organism groups that occur in different use classes, on the other hand with regard to their basis of calculation. Relative values (i.e. x-values) are the basis for assigning DCs independent from the applied test method.
- Guidance on sampling of wood and wood-based materials to be tested is specified for logs, sawn timber, sets of wood, modified timber, and wood-based panels.
- Information compiled in Annex A had been updated with regard to taxonomy. It indicates on which data basis a durability class was determined. Information is compiled now in only two tables, A.1 for softwood, A.2 for hardwoods.

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## Introduction

Wood durability is an important material property and factor that influences the service life of a wood product. This document provides input to service life prediction of wood and wood-based products. It is intended to give information relevant to the use of wood products appropriate for different end-uses avoiding excessive requirements. It also ranks biological 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 heartwood of a wood species given in Annex A 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.

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## 1 Scope

This document 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 to individual wood species and processed wood-based materials, including thermally and chemically modified, and water-repellent impregnated wood. Examples of wood-based materials are oriented strand boards (OSB), particle boards, fibre boards, laminated veneer lumber (LVL), and plywood. However, this document is not intended to give guidance on methods for determining and classifying the durability of wood products, coated wood, and wood polymer composites.

Preservative-treated wood is not within the scope of this document, since requirements for the effectiveness of wood preservatives and durability requirements of wood treated with preservatives are regulated in several other European standards. However, this does not apply to modified wood, which is why it is included in the scope of this document.

The wood-destroying agents considered in this document 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 the heartwood of selected wood species considered of economic importance in European countries are presented in Annex A (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 B (informative) for the classification of wood treatability with aqueous wood preservatives, Annex C (informative) for the classification of the permeability to water, and Annex D (informative) for the durability to disfiguring fungi.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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 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 84, *Durability of wood and wood-based products - Accelerated ageing of treated wood prior to biological testing - Leaching procedure*

EN 113-2, *Durability of wood and wood-based products - Test method against wood destroying basidiomycetes - Part 2: Assessment of inherent or enhanced durability*

EN 113-3, *Durability of wood and wood-based products - Test method against wood destroying basidiomycetes - Part 3: Assessment of durability of wood-based panels*

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*

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

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

ISO 13061-1, *Physical and mechanical properties of wood - Test methods for small clear wood specimens - Part 1: Determination of moisture content for physical and mechanical tests*

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.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 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.

**prEN 350:2026 (E)****3.4****wood-based material**

materials that are made by cutting up the wood into smaller parts, like veneers, particles or fibres, and then joining it together, usually by adding adhesives or binders, where the wood content by mass is at least 50 %; not regarded as wood materials are glued solid wood products, like glulam or cross-laminated timber

**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****biological durability**

inherent resistance of a wood species or a wood-based material against wood decay organisms, including the natural durability and the conferred durability achieved by a preservation, protection or modification treatment

Note 1 to entry: This inherent resistance is due to the presence of natural or technically introduced 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**

portion of woody tissue nearest the pith of the tree, often having properties that differ from mature wood

Note 1 to entry: Juvenile wood is a zone near to the pith, displaying marked sudden changes in its properties. There is no clear consensus as to where this zone ends. In temperate wood species, it is generally thought to end at 10 to 20 annual 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.

**3.11****permeability to water**

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

**3.12****performance**

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

Note 1 to entry: Performance can depend on a number of factors which will vary in importance depending on the end use.

Note 2 to entry: Guidance on performance is given by EN 460.

**4 Sampling of wood and wood-based materials to be tested****4.1 Testing wood species****4.1.1 General**

The origin of test specimens and the number of replicates is of great importance for the reliability of the test results.

The reliability of conclusions relating to the durability of a wood species increases with the number and diversity of growing sites from which trees are taken and the number of replicates from those trees. The recommendations given in 4.1.2 to 4.1.3 shall be regarded as minima.

NOTE Background information on sampling can be found in ISO 2859-2 and ISO 3129.

**4.1.2 Sampling logs**

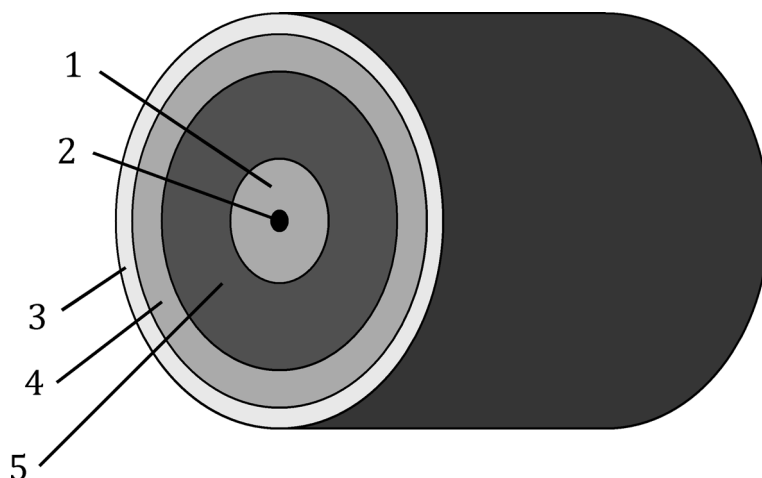
A log shall be taken from at least 3 trees of the species under test, originating from 3 different sites representative of the diversity of the geographical regions or sites where the tree species grows. Samples should be taken from at least 6 planks, originating from at least 3 trees when only sawn wood is available (see Annex A).

If high between-tree variation is expected (e.g. different botanic species), it is recommended to test a larger number of trees (e.g. 5 – 10).

Each log shall be of sufficient size to permit the required number of test specimens to be obtained from it.

Each log shall be taken from the main trunk avoiding its extreme ends. Knots and other features which can influence durability shall be avoided.

Sampling shall be done separately for sapwood and heartwood. If the log size allows for it, sampling shall be done separately for juvenile heartwood, mature heartwood (i.e. central heartwood), and transition wood (if present).



#### Key

- |   |                            |
|---|----------------------------|
| 1 | juvenile heartwood         |
| 2 | pith                       |
| 3 | sapwood                    |
| 4 | transition wood            |
| 5 | mature (central) heartwood |

**Figure 1 — Differentiation of stem zones for sampling**

For each part of the wood (juvenile heartwood, mature (central) heartwood, transition wood, sapwood) to be tested, at least 30 test specimens shall be taken for each test variable (for example “test method” or “test organism”). A minimum of 6 specimens shall be taken from each log.

**NOTE** The number of replicates for juvenile wood may also be smaller if the available wood requires this.

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).

#### 4.1.3 Sampling sawn timber

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

#### 4.1.4 Sampling sets of wood

Since (untreated) timbers are mostly presented on the market as commercial supplies there is a need to assess their durability. The largest possible number of wood boards shall be used for the realization of the test specimens (e.g. 2 replicate test specimens from each of 20 boards are preferred to 10 specimens from each of 4 boards). 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”). The general considerations described in 4.1.2 related to sampling also apply for sawn wood.

## 4.2 Testing of wood-based materials

### 4.2.1 Sampling modified timber

A modified timber (solid wood) is specified by the wood species, the type of modification process (e.g. thermal, chemical) and the treatment intensity (i.e. temperature level for thermal, weight percent gain for chemical modification). Samples of the modified timber should be taken from at least 3 production batches or lots. From each production batch or lot, a minimum of 3 boards (pieces) shall be randomly taken, in total 9 boards. The test specimens required for the biological tests shall be cut evenly from all 9 boards.

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”) and take samples randomly over the entire cross section. The latter is also intended to ensure that both, sapwood and heartwood are evenly represented as well as potential impregnation gradients.

### 4.2.2 Sampling wood-based panels

The sampling should take into account the variability of types of wood-based panels. A wood-based panel material is specified mainly by type (e.g. plywood, OSB, particle board, fibre board), thickness, adhesive, wood-species, and particle size. The information documented in the test report should allow to identify the material.

At least three panels shall be taken randomly from a defined product or delivery unit (e.g. batch, lot, daily production). From each panel, at least four test specimens shall be cut and exposed to each test fungus. A minimum of 12 replicate test specimens shall be tested.

## 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  $20 \pm 2^\circ\text{C}$  /  $65 \pm 5\%$  relative humidity, until constant mass according to EN 13183-1.

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  $60^\circ\text{C}$  prior to the test.

If the common drying temperature is higher than  $60^\circ\text{C}$  wood can be oven-dried at respective temperatures higher than  $60^\circ\text{C}$ , but the latter shall be documented and reported.

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

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. Deviations from the instruction for sample selection shall be reported.

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, but shall be reported.

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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, but shall be reported. 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.

In this document, different classes of durability are assigned for different organism groups. There are five organism groups for which durability classes are assigned: decay fungi (above ground), decay fungi (soil/water contact), wood boring beetles, termites, and marine organisms. The test requirements for each of these is given in Table 1. These methods shall be used for determining the biological durability of wood for each of the groups.

**Table 1 — Organism groups in different use classes and test requirements relevant to the durability classification within organism groups**

| Organism group                                                                                                                                                                                                                                                                                                                                                                   | Laboratory tests              | Field tests                                                                                                                 | Use class            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------|
| Decay fungi – above ground                                                                                                                                                                                                                                                                                                                                                       | EN 113-2/-3<br>CEN/TS 16818   | EN 12037 <sup>a</sup><br>EN 330 <sup>a</sup><br>Bundle-test <sup>a</sup><br>Sandwich-test <sup>a</sup><br>etc. <sup>a</sup> | UC 2, UC 3.1, UC 3.2 |
| Decay fungi – soil/water contact                                                                                                                                                                                                                                                                                                                                                 | EN 113-2/-3<br>CEN/TS 15083-2 | EN 252                                                                                                                      | UC 4, UC 5           |
| Wood boring beetles                                                                                                                                                                                                                                                                                                                                                              | EN 46-1<br>EN 49-1<br>EN 20-1 | n.a.                                                                                                                        | All <sup>b</sup>     |
| Termites                                                                                                                                                                                                                                                                                                                                                                         | EN 117                        | EN 252<br>Ground proximity test                                                                                             | All <sup>c</sup>     |
| Marine organisms                                                                                                                                                                                                                                                                                                                                                                 | n.a.                          | EN 275                                                                                                                      | UC 5                 |
| <sup>a</sup> It is only necessary to undertake one of the above-ground field tests.<br><sup>b</sup> They may not be present or economically significant in all service conditions in all geographic regions, or may not be able to attack some wood-based products due to the specific constitution of the product. <sup>c</sup> for wood used in regions with a termite hazard. |                               |                                                                                                                             |                      |

All laboratory tests in Table 1 shall be conducted after accelerated ageing in accordance with EN 84.

To ensure that durability classifications are made to be as applicable to as many use classes as possible, leaching in accordance with EN 84 is required in all cases. However, leaching is not a hazard that is associated with UC1 and UC2. If a wood species or wood-based material is being tested specifically for use in UC1 or UC2 then this may be tested after accelerated ageing in accordance with EN 73 instead of EN 84. In practice, for a given use class, different organism groups will need to be considered.

## 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 excluding juvenile wood. 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 2 — Durability classes (DC) of wood and wood-based materials to attack by decay fungi**

| Durability class | Description        |
|------------------|--------------------|
| DC 1             | Very durable       |
| DC 2             | Durable            |
| DC 3             | Moderately durable |
| DC 4             | Slightly durable   |
| DC 5             | 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 A, 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 and durability 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 3 — Durability classes (DC) of wood and wood-based materials to attack by wood-boring beetles**

| Durability class | Description |
|------------------|-------------|
| DC D             | Durable     |
| DC S             | Not durable |

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

Durability to *Lyctus brunneus* is not mentioned in the list (see Annex A, Tables A.2 and A.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