

European standard

French standard

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Durability of wood and wood-based products

Preservative-treated solid wood

Part 2: Guidance on sampling for the analysis of preservative-treated wood

F : Durabilité du bois et des produits à base de bois — Bois massif traité avec produit de préservation — Partie 2 : Guide d'échantillonnage pour l'analyse du bois traité avec un produit de préservation

D : Dauerhaftigkeit von Holz und Holzprodukten — Mit Holzschutzmitteln behandeltes Vollholz — Teil 2: Leitfaden zur Probenentnahme für die Untersuchung des mit Holzschutzmitteln behandelten Holzes

French standard approved

by decision of the Director General of AFNOR on August 22, 2007 taking effect on September 22, 2007.

Replaces the approved standard NF EN 351-2 dated September 1995.

Correspondence

The European standard EN 351-2:2007 has the status of French standard.

Analysis

This document gives the procedures to be used in obtaining samples of preservative-treated wood for the determination of penetration and retention of wood preservative.

Descriptors

Technical International Thesaurus: wood, durability, wood preservatives, sampling, impregnating, chemical analysis.

Modifications

With respect to document replaced:

- introduction of terms with their definition in Clause 3;
- addition of Clause 4 "Choice of the technical batch";
- removal of the paragraph "Longitudinal sections".

Corrections



National foreword*References to French standards*

The correspondence between the standards figuring in the clause "Normative references" and the identical French standards is as follows:

EN 1001-2 : NF EN 1001-2 (classification index: X 40-003-2)

ISO 2859-1 : NF ISO 2859-1 (classification index: X 06-022-1)



English Version

Durability of wood and wood-based products - Preservative-treated solid wood - Part 2: Guidance on sampling for the analysis of preservative-treated wood

Durabilité du bois et des produits à base de bois - Bois massif traité avec produit de préservation - Partie 2 : Guide d'échantillonnage pour l'analyse du bois traité avec un produit de préservation

Dauerhaftigkeit von Holz und Holzprodukten - Mit Holzschutzmitteln behandeltes Vollholz - Teil 2: Leitfaden zur Probenentnahme für die Untersuchung des mit Holzschutzmitteln behandelten Holzes

This European Standard was approved by CEN on 21 June 2007.

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Foreword

This document (EN 351-2:2007) 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 January 2008, and conflicting national standards shall be withdrawn at the latest by January 2008.

This document supersedes EN 351-2:1995.

Significant technical differences between this edition and EN 351-2:1995 are as follows:

- a) introduction of terms with their definition in clause 3;
- b) addition of clause 4 "Selection of batch";
- c) deletion of the sub-clause "Longitudinal sections" for sampling to determine the axial penetration.

This document consists of two parts. Part 1 is concerned with defining the penetration requirements and gives guidance on the retention requirements for preservatives in preservative-treated solid wood. Part 2 gives guidance on the general procedures to be followed in the sampling for analysis of preservative-treated solid wood.

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



1 Scope

This part of EN 351 provides guidance on the general procedures used in obtaining samples of preservative-treated wood to determine the penetration and retention of wood preservative.

This part of EN 351 is applicable for the production of preservative-treated solid wood, including glued laminated timber, suitable for use in those service conditions defined by the use classes in EN 335-1. However, the sampling guidance provided within this part of EN 351 may be applied for the subsequent examination of treated wood in service.

2 Normative references

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

EN 1001-2:2005, *Durability of wood and wood-based products — Terminology — Part 2: Vocabulary*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

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

3.1
active ingredient(s)
individual chemical compound or compounds included in a wood preservative product to give it specific activity against biological agents of deterioration

NOTE Adapted from EN 1001-2:2005, **4.01**.

3.2
analytical zone
part of the treated wood that is analysed for assessing compliance with the retention requirement (see 3.8)

NOTE The analytical zone is taken from the lateral surfaces of the treated wood. The depth to which sampling is required will depend upon the species of wood being analysed and the treatment level concerned.

[EN 1001-2:2005, **4.03**]

3.3
batch
clearly identifiable collection of units of preservative treated wood manufactured to conform to the same defined penetration and retention requirements

[EN 1001-2:2005, **4.04**]

3.4
charge
all the wood treated together in a single operation

[EN 1001-2:2005, **4.13**]



3.5**composite sample**

collection of all test samples derived from the sampling units (3.9) taken from the batch (3.3) in accordance with the chosen sampling plan for determining retention

[EN 1001-2:2005, 4.15]

3.6**incising**

procedure of puncturing the lateral surfaces of wood as an aid to secure deeper and more uniform penetration of wood preservative

[EN 1001-2:2005, 4.38]

3.7**penetration requirement**

minimum depth at which the active ingredient(s) (3.1) of the wood preservative is (are) required to penetrate the wood

[EN 1001-2:2005, 4.59]

3.8**retention requirement**

loading of the wood preservative product that is required in the analytical zone

NOTE The retention requirement is expressed in grams of product per square metre for superficial application processes and kilograms of product per cubic metre for penetrating treatment processes. It is derived from the critical value in different ways depending upon the particular test involved.

[EN 1001-2:2005, 4.73]

3.9**sampling unit**

one unit (for example a pole, a board, a fence post) of preservative-treated wood taken from a batch (see 3.3) of preservative-treated wood

[EN 1001-2:2005, 4.75]

4 Selection of batch

For the selection of a batch the following shall be considered and deviations reported:

- Batch shall be selected with respect to the aim of the subsequent sampling and analysis.

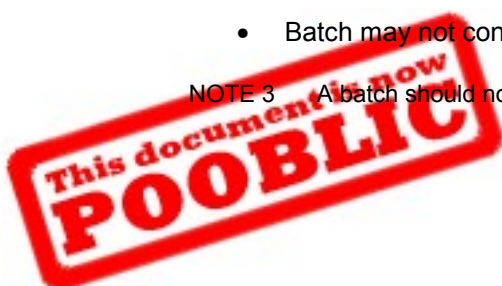
NOTE 1 In practice the selection of a batch is the result of a compromise between the aim of the inspection and the quality of the analysis in terms of technical and financial considerations.

- Batch shall be selected in such a way that the subsequent selection of sampling units is representative for the batch.
- Batch may consist of one charge or several charges treated on different occasions.

NOTE 2 If sampling is to be carried out from the same commodity manufactured at different plants at the same site, the batch should be selected in such a way that commodities from the different plants are represented in the batch.

- Batch may not consist of different commodities.

NOTE 3 A batch should not consist of a mixture of round and sawn wood.



5 Selection of sampling units from a batch

Sampling units shall be selected to be representative of the entire batch being considered.

The number of sampling units shall be in accordance with the guidance in ISO 2859-1. See Annex A for guidance.

NOTE If sapwood penetration is to be determined, units consisting entirely of heartwood should be avoided.

Individual techniques for determining penetration and retention could impose special requirements for sampling and subsequent handling which shall be reported.

6 Selection of test samples from a sampling unit

Test samples shall be selected from the sampling units according to the following principles:

- If penetration and retention can be determined from a single test sample, only one test sample per sampling unit is necessary. Otherwise, two test samples shall be taken per sampling unit for the separate determination of penetration and retention.
- Test samples shall be taken from clear, straight-grained wood, away from splits, checks, other defects and man-made holes or cuts and at least 100 mm away from knots in a longitudinal direction. For assessment of retention and lateral penetration, test samples shall be taken midway between ends or at least 100 mm from knots in a longitudinal direction. For assessment of retention and lateral penetration, test samples shall be taken midway between ends or at least 300 mm from the end.
- Test samples shall be taken as borings, cross-sections, or thin sections (see Clause 7 and Clause 8) as appropriate with respect to the commodities sampled and the methods to determine the penetration and retention.

NOTE 1 Borings are normally suited for round wood (poles, piles) and thicker dimensions of sawn wood (railway sleepers).

NOTE 2 To determine the preservative retention, cross-sections will form a more reliable basis than borings, as the whole analytical zone will be available for examination for cross-sections.

7 Test samples for determining penetration

7.1 Boring

7.1.1 General

Borings shall not be used to determine axial penetration.

Borings shall be taken with a sharp increment borer which extracts a core of minimum diameter of 5 mm.

If any part of the sample is lost the whole sample shall be rejected and a new one taken.

If material is incised, borings shall be taken at a point midway between adjacent incisions.

NOTE All borer holes should be promptly plugged with tight fitting wooden plugs pre-treated with an appropriate preservative.



7.1.2 Round and part-round wood

For round wood the borer shall be directed towards the pith from any point on the surface.

For part-round wood the borer shall be directed towards the pith (or the point where the pith would have been in the original log) from a point on the curved surface which is furthest away from the cut surface(s).

If a defined penetration depth, less than complete penetration, is required, the borer shall penetrate to a depth greater than the penetration measured (see Figure 1).

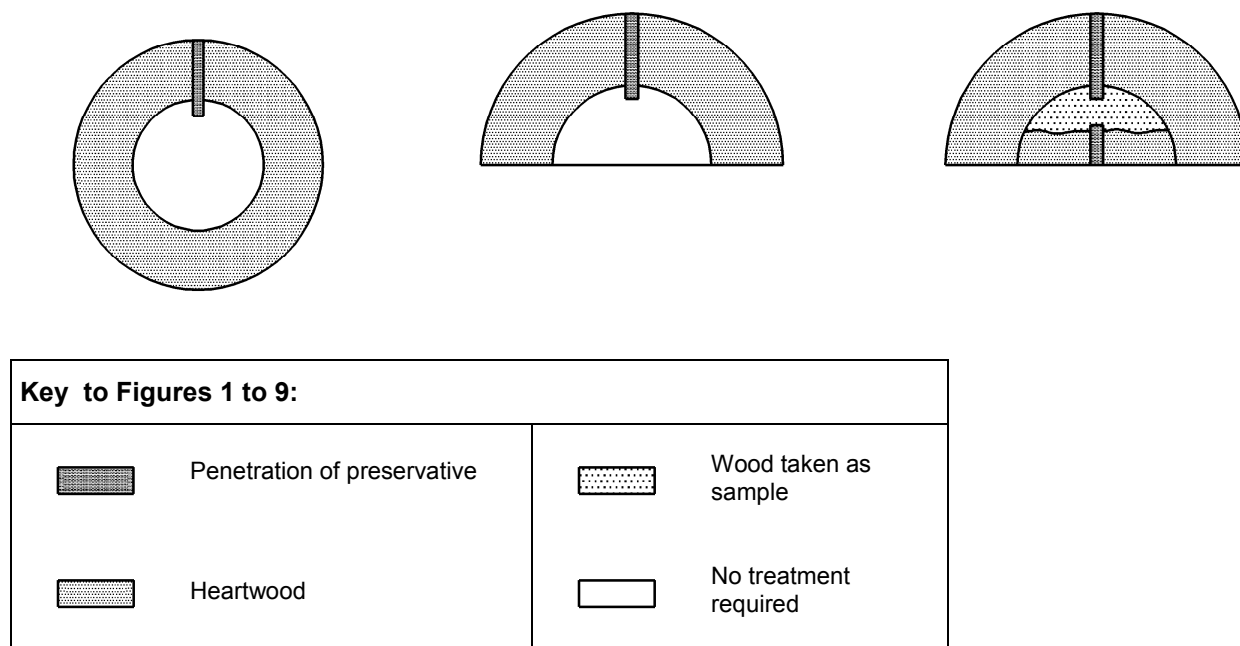


Figure 1 — Sampling location in round and part-round wood if a defined penetration depth is required

If the requirement is for complete penetration, it is necessary for the borer to penetrate to the geometrical centre of the cross-section (see Figure 2).

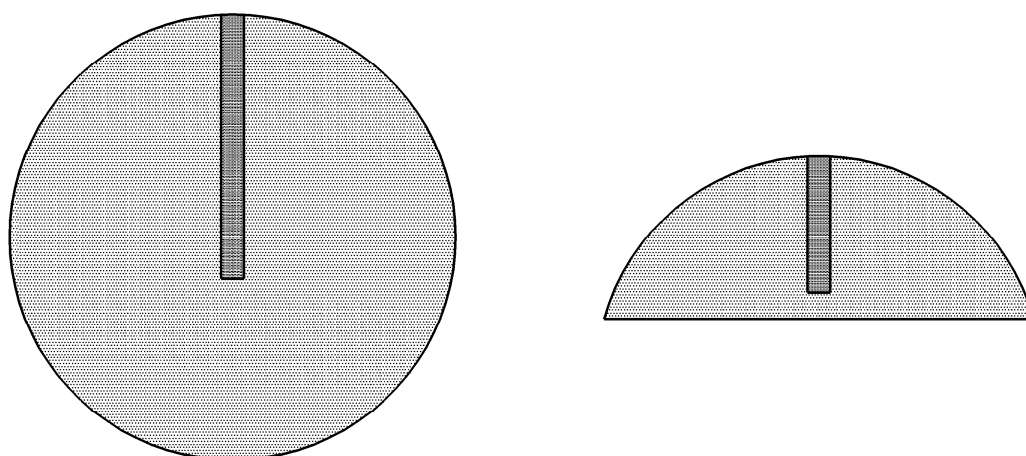


Figure 2 — Sampling location in round and part-round wood if complete penetration is required

7.1.3 Sawn and profiled wood

If a defined penetration depth, less than full sapwood penetration is required, borings shall be taken as far as possible, equidistant from the sides and perpendicular to the face being sampled to a depth greater than the penetration being measured (see Figure 3).

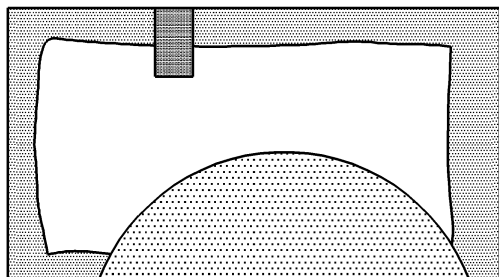


Figure 3a - Sampling location in samples containing both sapwood and heartwood

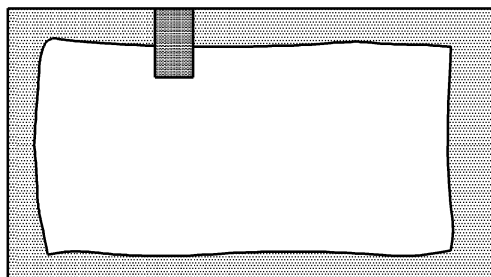


Figure 3b - Sampling location in samples consisting entirely of sapwood or if it is impossible to identify any heartwood before sampling

Figure 3 — Sampling location in sawn and profiled wood if a defined penetration depth is required

If full sapwood penetration is required, borings shall be taken, as far as possible, in the radial direction and where the depth of sapwood is greatest. From sampling units consisting entirely of sapwood or if it is impossible to identify any heartwood before sampling, the boring shall be taken equidistant from the sides and perpendicular to the face being sampled to a depth of half the thickness of the sampling unit (see Figure 4).

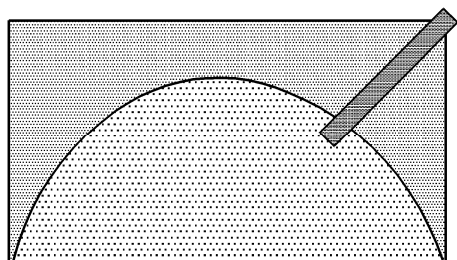


Figure 4a - Sampling location in samples containing both sapwood and heartwood

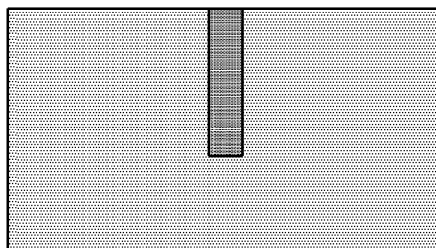


Figure 4b - Sampling location in samples consisting entirely of sapwood or if it is impossible to identify any heartwood before sampling

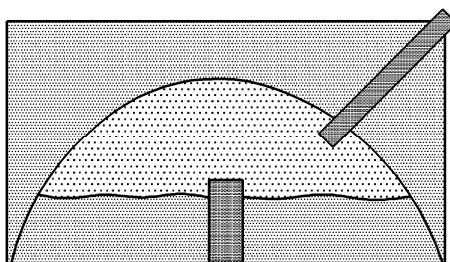


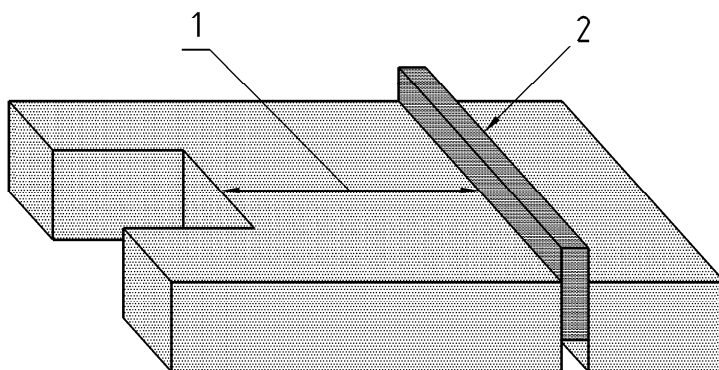
Figure 4c - Sampling locations in samples containing both sapwood and heartwood and where a defined penetration depth is required in the heartwood

Figure 4 — Sampling locations in sawn and profiled wood if full sapwood penetration is required

7.2 Cross-sections

To determine lateral penetration a complete cross-section test sample shall be obtained from the sampling unit by making two saw cuts completely through the test sample beyond the extent of axial penetration 10 mm apart and perpendicular to the lateral surfaces of the wood.

To determine the axial penetration two saw cuts shall similarly be made, the first at a distance from the end grain equal to the penetration requirement and the second 10 mm in excess of this (see Figure 5). If the ends of sampling units have been cut to accommodate joint systems, the base of the deepest cut made into the end grain is considered to be the relevant end grain.



Key

- 1 Required axial penetration
- 2 Section for penetration test

Figure 5 — Cross-cut sampling for the determination of the axial penetration in sampling unit containing mortise

8 Test samples for determination of retention

8.1 General

The retention in the analytical zone shall be determined as the retention of a composite sample or as the mean retention of individual samples of thin sections, borings or cross-sections.

Deposits of wood preservative on the wood surface shall be removed before analysis.

NOTE 1 The active ingredient(s) of the wood preservative and the analytical method itself are decisive for the minimum amount of sample needed.

NOTE 2 For calculation and expression of the retention either the actual air dry density (12 % moisture content) may be measured or a nominal density with reference to EN 350-2 or knowledge of specific timber characteristics. Care should be taken when deriving the density from core borings since compression or elongation can occur during sampling process.

8.2 Thin sections

Samples shall be taken from a lateral surface either by:

- a) using a Forstner auger bit, which produces thin shavings and results in a smooth-sided, flat-bottomed hole of well-defined area ; or
- b) using a chisel; or
- c) planing or sawing.

8.3 Borings

Borings to be used for determining retention shall be cut to include only the required analytical zone.

NOTE With borings, a proportionally too small part of the outer analytical zone is sampled which results in a lower retention than would be found with cross-sections. Consequently, borings are normally restricted for round wood (poles, piles) and thicker dimensions of sawn wood (railway sleepers). To compensate for this fact a factor (gradient factor) may be used when calculating the retention. The gradient factor must be determined for each wood preservative and each wood species.

8.4 Cross-sections

Cross-sections selected for the determination of retention shall be cut to include only the analytical zone (see Figure 6 and Figure 7). However, for round wood and part - round wood cross-sections a sector can be removed and the required analytical zone taken from the sector (see Figure 8 and Figure 9).

NOTE A 10° sector is normally adequate.

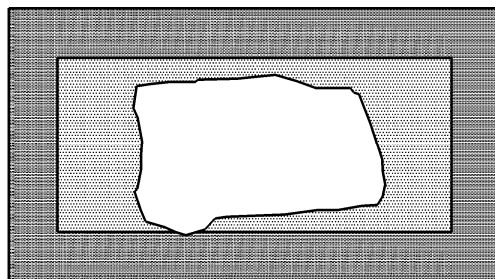


Figure 6 — Sampling location for analysis of retention in cross-sections of sawn and profiled wood; defined penetration requirement

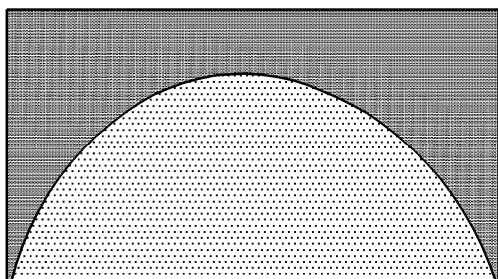


Figure 7a - Full sapwood penetration requirement

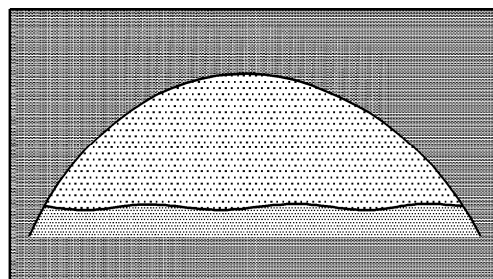


Figure 7b - Full sapwood penetration and a defined penetration depth in the heartwood

Figure 7 — Sampling location for analysis of retention from cross-sections of sawn and profiled wood

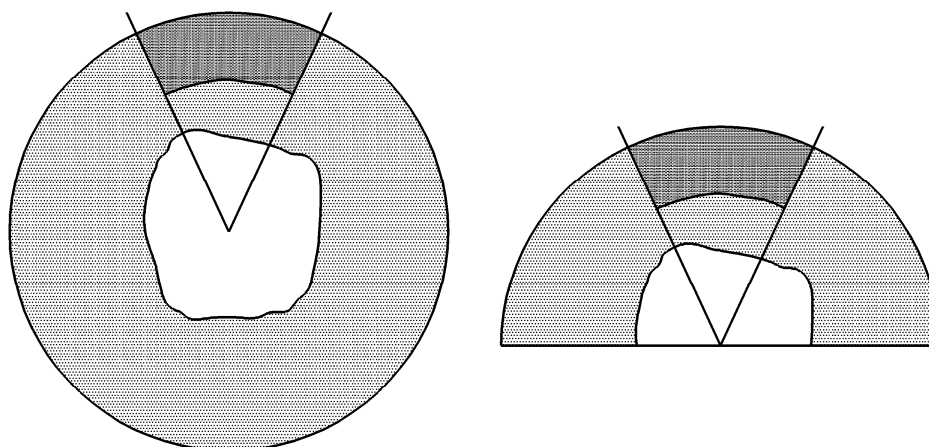


Figure 8 — Sampling location for analysis of retention in cross-sections of round and part-round wood; defined penetration requirement

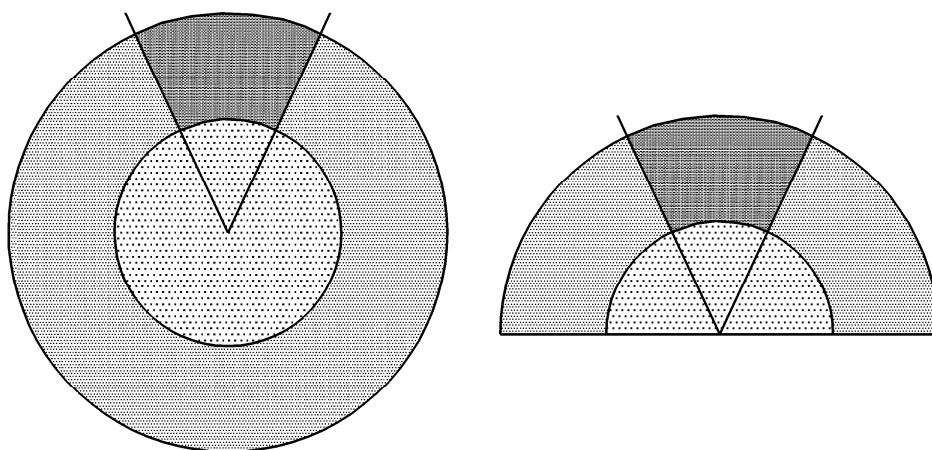


Figure 9 — Sampling location for analysis of retention in cross-sections of round and part-round wood; full sapwood penetration requirement

Annex A (informative)

Selection of number of sampling units

The International Standard ISO 2859-1 describes sampling procedures that may be selected to suit the accuracy with which the quality of the product is to be judged. Two key features should be addressed in selecting sampling plans.

a) Acceptable quality level (AQL)

The AQL is the maximum number of samples per hundred that can be defective as a process average without the batch produced by that process being rejected. It follows, therefore, that an AQL of 1 % (where only one sample in every hundred of the batch as a whole would be expected to fail if the whole batch was tested) is a much more rigorous requirement than AQL of 10 %.

Clearly where preservative-treated timber is to perform some critical function in a building, the AQL expressed as a percentage is likely to be relatively low.

b) Inspection Level

The inspection level determines the relationship between the batch size and the sample size. Seven inspection levels are given in ISO 2859-1. Inspection levels I, II and III are given for general use with Inspection level III representing the most rigorous sampling regime and Inspection level I the least. Less demanding are the four additional special inspection levels. S-1, S-2, S-3 and S-4 (S-4 the most rigorous and S-1 the least rigorous). However, these special inspection levels are found to be useful where only relatively small sample sizes are practical or economic and large sampling risks can be taken or tolerated. Clearly where a relatively large number of samples is taken from a batch, there is a greater probability of achieving a correct appraisal of the condition of the batch from those samples.

The choice of inspection level should be left to the specifier, but, as with selection of AQL, it should be noted that if the preservative-treated timber is to perform some critical function in a building, a relatively high inspection level should be chosen.

Table A.1 and Table A.2 present the number of samples that should be taken from batches of different sizes, together with the associated maximum number of samples allowed to fail before rejection under Inspection Level II and Special Inspection Level S-3 respectively. Level S-3 will normally be used unless otherwise specified. For instance where 13 to 1 appears in the tables this means that 13 samples should be taken at random from the batch and that a maximum of 1 is allowed to fail before rejection of the batch.



Table A.1 — Number of samples to be taken and maximum numbers allowed to fail for different AQLs (expressed as percent) using Inspection Level II

Batch size	AQL in %				
	1	4	10	15	25
16 to 25	13 to 0	3 to 0	5 to 1	5 to 2	5 to 3
26 to 50	13 to 0	13 to 1	8 to 2	8 to 3	8 to 5
51 to 90	13 to 0	13 to 1	13 to 3	13 to 5	13 to 7
91 to 150	13 to 0	20 to 2	20 to 5	20 to 7	20 to 10
151 to 280	50 to 1	32 to 3	32 to 7	32 to 10	32 to 14
281 to 500	50 to 1	50 to 5	50 to 10	50 to 14	50 to 21
501 to 1 200	80 to 2	80 to 7	80 to 14	80 to 21	50 to 21
1 201 to 3 200	125 to 3	125 to 10	125 to 21	80 to 21	50 to 21
3 201 to 10 000	200 to 5	200 to 14	125 to 21	80 to 21	50 to 21
10 001 to 35 000	315 to 7	315 to 21	125 to 21	80 to 21	50 to 21
35 001 to 150 000	500 to 10	315 to 21	125 to 21	80 to 21	50 to 21
150 001 to 500 000	800 to 14	315 to 21	125 to 21	80 to 21	50 to 21

Table A.2 — Number of samples to be taken and maximum numbers allowed to fail for different AQLs (expressed as percent) using Inspection Level S-3

Batch size	AQL in %				
	1	4	10	15	25
16 to 25	13 to 0	3 to 0	5 to 1	3 to 1	3 to 2
26 to 50	13 to 0	3 to 0	5 to 1	3 to 1	3 to 2
51 to 90	13 to 0	3 to 0	5 to 1	5 to 2	5 to 3
91 to 150	13 to 0	3 to 0	5 to 1	5 to 2	5 to 3
151 to 280	13 to 0	13 to 1	8 to 2	8 to 3	8 to 5
281 to 500	13 to 0	13 to 1	8 to 2	8 to 3	8 to 5
501 to 1 200	13 to 0	13 to 1	13 to 3	13 to 5	13 to 7
1 201 to 3 200	13 to 0	13 to 1	13 to 3	13 to 5	13 to 7
3 201 to 10 000	13 to 0	20 to 2	20 to 5	20 to 7	20 to 10
10 001 to 35 000	13 to 0	20 to 2	20 to 5	20 to 7	20 to 10
35 001 to 150 000	50 to 1	32 to 3	32 to 7	32 to 10	32 to 14
150 001 to 500 000	50 to 1	32 to 3	32 to 7	32 to 10	32 to 14

Bibliography

- [1] EN 351-1, Durability of wood and wood-based products — Preservative-treated solid wood — Part 1: Classification of preservative penetration and retention.
- [2] EN 350-2, Durability of wood and wood-based products — Natural durability of solid wood — Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe.
- [3] EN 12490, Durability of wood and wood-based products — Preservative-treated solid wood — Determination of the penetration and retention of creosote in treated wood

