

# **Nordic requirements for quality control of industrially protected wood**

## **Part 1: Scots pine and other permeable softwoods**

**NWPC Document No 3:2017**

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## NWPC Document No 3:2017, Part 1

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## 1 Background

Official quality requirements for industrially protected wood have existed in the Nordic countries since the mid 1970s, when a common Nordic standard for preservative-treated wood (INSTA 140) was introduced after an initiative by the Nordic Wood Preservation Council (NWPC). The classification of preservative-treated wood introduced in that standard has been further elaborated in NWPC Document No 1, Part 1.

For treaters who want to treat wood according to NWPC Document No 1, Part 1, affiliation to a third party quality control scheme is required. The present conditions and requirements for that third party quality control are described in NWPC Document No 3, Part 1.

This edition will supersede NWPC Document No 3:2013, Part 1.

Significant technical differences between this and the previous edition are as follows:

- This Document covers a new wood protection class, NTR A pole
- The guidelines for sanctions when the treatment does not comply with the requirements have been carefully reviewed and updated

## 2 Scope

This Document contains requirements for quality control of industrially protected wood of pine (*Pinus* spp) and other permeable softwoods produced to comply with the requirements for the wood protection classes NTR M, NTR A, NTR A pole, NTR AB and NTR B according to definitions in NWPC Document No 1, Part 1.

This Document is applicable to the following general commodities:

- Sawn and planed timber (NTR A, NTR AB)
- Railway sleepers (NTR A)
- Poles and piles, i.e. poles for utilities and telecom (NTR A pole) and piles for foundations (NTR A pole) and marine end uses (NTR M)
- Fence posts and round wood of small dimensions, i.e. round wood that is not considered as poles or piles, with a diameter of 50-120 mm for use in gardens, agriculture, public parks etc. (NTR A)
- Windows and doors (NTR B)

This Document also contains NWPC requirements for quality control bodies in order to get NWPC approval to carry out quality control of preservative-treated wood according to this Document.

This Document is not intended for investigation of preservative-treated wood in use.

Note. Updated lists of producers of treated wood, affiliated to quality control according to this Document, as well as of those quality control bodies that are approved by the NWPC can be seen on [www.ntr-nwpc.com](http://www.ntr-nwpc.com).

## 3 References

For undated references, the latest edition of the referenced document applies.

NWPC Document No 1	Nordic wood protection classes and product requirements for industrially protected wood. Part 1: Scots Pine and other permeable softwoods.
EN 212	Wood preservatives. General guidance on sampling and preparation for analysis of wood preservatives and treated timber

EN 350	Testing and classification of the durability to biological agents of wood and wood-based materials
EN 351	Durability of wood and wood-based products. Preservative-treated solid wood Part 1. Classification of preservative penetration and retention Part 2. Guidance on sampling for the analysis of preservative-treated wood
EN 13991	Derivatives from coal pyrolysis – Coal tar based oils: creosotes – Specifications and test methods
ISO 2859-1	Sampling procedures for inspection by attributes Sampling schemes indexed by acceptable quality level (AQL) for lot-by-lot inspection
EN 12490	Durability of wood and wood-based products - Preservative-treated solid wood - Determination of the penetration and retention of creosote in treated wood
EN ISO/IEC 17020	Conformity assessment -- Requirements for the operation of various types of bodies performing inspection
EN ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories

## **4 Quality control bodies**

### **4.1 Approval**

The NWPC Board approves quality control bodies to carry out quality control of preservative-treated wood according to this Document.

Application for approval shall be sent to NTR/NWPC Secretariat. The quality control body will receive a Letter of confirmation when approved.

### **4.2 Requirements on quality control bodies**

Quality control bodies shall have sufficient expertise and logistics in handling third party control related to the wood preserving industry.

Quality control bodies doing inspections of preservative-treated wood should be accredited according to EN ISO IEC 17065. Laboratories performing analyses do not need to be accredited for the specific analyses but shall have an accreditation, i.e. have a quality system in place according to EN ISO IEC 17025.

### **4.3 Termination**

Termination of the control body by the NWPC can be made at the latest by November for the following year. Termination by the quality control body can be made without previous notice to the NWPC.

## **5 Definitions**

Charge	All the wood treated together in a single operation
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Batch	Clearly identifiable collection of units of preservative-treated wood manufactured to conform to the same defined penetration and retention requirements, e.g. poles, fence posts, sawn and planed timber, railway sleepers etc.
Sampling unit	One unit (for example a pole, a board, a fence post) of preservative-treated wood taken from a batch of preservative-treated wood
Composite sample	Collection of all test samples derived from the sampling units taken from the batch in accordance with the chosen sampling plan for the determination of retention
Sampling	All samples taken from a batch at the same time for the analysis of penetration and retention

## 6 Requirements for affiliation to quality control

### 6.1 General

Producers of industrially protected wood who wish to produce according to the requirements in NWPC Document No 1, Part 1, can for each of their production sites, seek affiliation to quality control according to this Document.

The requirements for affiliation to the quality control are stated in clauses 6.2 to 6.7.

### 6.2 Equipment

The treatment plant shall be designed and equipped in such a way that the requirements for the requested wood protection class according to NWPC Document No 1, Part 1, can be fulfilled.

The plant shall always be equipped with:

- Manometers for instantaneous reading of pressure and vacuum as well as instruments for continuous monitoring the process; process times, pressure and vacuum.
- Instrument to measure the moisture content in the timber before treatment. Electric devices shall be equipped with insulated electrodes at least 30 mm long.
- Device to measure the uptake of wood preservative/treating solution for each charge.

If the process requires heat, the plant shall be equipped with an instrument for registration of the temperature of the preservative/treating solution.

Note For example, heat is required for treatment with creosote and for water-borne systems during the winter.

If the preservative is delivered as a concentrate, paste or powder for preparation of the treating solution, the plant shall have equipment to measure the concentration of the treating solution.

### 6.3 Instructions

Written instructions shall be available for:

- The plant's operation and maintenance
- The factory production control
- Preparation of treating solution (if prepared on site)
- Preservative treatment at temperatures below 0 °C, if applicable, and guidance on fixation conditions
- Action required when the quality of treatment fails to comply with the requirements.

Instructions from the preservative supplier on correct handling and use of the supplier's preservative shall be available. If applicable, these instructions must include information on fixation conditions.

In case of waterborne preservatives based on copper, the specification from the producer must be followed. However, a duration of minimum 3 days for fixation is required when the temperature is above 0°C. For other preservatives, the recommendation from the preservative supplier shall be followed as to when the preservative treated wood is ready to leave the production site.

#### **6.4 Factory production control**

Continuous factory production control shall be carried out according to clause 8.2 under the supervision of the plant operator in charge.

#### **6.5 Description of the production**

Attached to the application for quality control, the producer shall prepare a description of the production with at least the following contents:

- Contact details of the producer/production site (address, phone no, e-mail etc.)
- Plant operator in charge and deputy
- Production statistics (with respect to commodity, wood protection class and preservative used)
- Commodities and wood protection classes to be comprised in the quality control
- Production equipment, treatment processes used, type of process control (manual/automatic)
- Equipment for factory production control
- Instructions see clause 6.3.

#### **6.6 Initial inspection**

Before the production plant can be affiliated to the quality control, the production equipment, equipment and routines for factory production control shall be examined and approved by the quality control body.

#### **6.7 Affiliation to the quality control**

When the initial inspection has been approved, the producer can be affiliated to the quality control. This is confirmed by a written agreement between the producer and quality control body.

#### **6.8 Rights and obligations of the producers affiliated to the quality control**

When the requirements in this Document are satisfied, the producer has the right to produce classified, industrially protected wood according to NWPC Document No 1, Part 1, as well as the right and obligation to brand the treated wood with the NWPC quality marks, cf. clause 9 Marking.

The right to brand treated wood with the NTR quality mark is communicated in a certificate comprising wood protection class, commodity and wood preservative. The certificate will be invalid when subject to changes regarding wood protection class, commodity, wood preservative or because of sanctions according to clause 10.

Treated wood produced according to other specifications than stated in NWPC Document No 1, Part 1, shall be clearly branded with a different mark.

The producer alone is responsible for the treated wood produced.

Any changes in connection with the production or plant operator in charge must be reported in writing to the quality control body without any delay.

The costs in connection with the application process, initial inspection, approval and issuing of certificate as well as annual inspections including analyses and reporting shall be paid by the producer according to the regulation of the quality control body.

For producers not belonging to the NWPC member countries, the NWPC Secretariat will invoice an annual fee as well as a royalty related to the production of wood treated according to NWPC Document No 1, Part 1. These fees are subject to decision at the NWPC annual meeting.

## **7 Withdrawal from the quality control scheme**

The producer can withdraw from the quality control scheme with one month's written notice. However, the producer is obliged to fulfil his economical obligations with respect to the quality control scheme for the present fiscal year.

## **8 Quality control of preservative-treated wood**

### **8.1 General**

Quality control of preservative-treated wood consists of factory production control according to 8.2 and third party control according to 8.3.

### **8.2 Factory production control**

#### **8.2.1 Aim and scope**

The aim of the factory production control is to steer and ensure the quality of the production with respect to those product requirements defined for each wood protection class in NWPC Document No 1, Part 1.

Detailed requirements for the factory production control cannot be given but shall be adapted to the individual production routines at each production site.

The most important parts of the factory production control are:

- Checking that the wood to be treated conforms with the requirements in NWPC Document No 1, Part 1
- In connection with delivery of wood preservative, a sample should be taken and saved for future analysis of active ingredients. The preservative manufacturer must be consulted with respect to shelf life and storage conditions.
- Checking the concentration of the treating solution (when applicable) before treatment
- Selection of a suitable process as well as monitoring the process
- Checking the result of the treatment, i.e. penetration and uptake of treating solution of the preservative shall comply with the requirements in NWPC Document No 1, Part 1
- Checking that the delivery requirements, e.g. labelling, fixation or moisture content are fulfilled
- Recording the treatment, cf. 8.2.2.
- Application routines for handling any deviation observed at the factory production or third party control.

Instructions for the factory production control shall be prepared, see clause 6.3.

#### **8.2.2 Treatment records**

The production must be recorded continuously with at least the following:

- Date and charge number
- Wood species, commodity and quantity
- Wood protection class according to NWPC or other treatment specification not covered by NWPC Document No 1, part 1.



- Highest and lowest moisture content measured before treatment,
- Wood preservative used, concentration (if diluted) of treating solution and temperature if heating is part of the process
- Treatment process (times, pressure and vacuum)
- Uptake of treating solution/preservative for each charge (litre/m<sup>3</sup> total volume of wood)
- Result of factory production control with respect to penetration (number of samples/number approved)
- Re-treatment, if applicable, and result of penetration analysis

Note Treatment records can be kept electronically or as printouts from computers etc.

It shall be clearly stated in the records who was responsible for the treatment and the records shall be filed for at least three years.

### 8.3 Third party control

Third party control shall be conducted by a quality control body approved by the NWPC board, see clause 4.

The aim of the third party control is to ensure that the factory production control is satisfactory and to check that the quality of the treated wood complies with the requirements in NWPC Document No 1, Part 1.

The third party control shall be carried out by at least two unannounced inspections during one calendar year. When inspections will take place is decided by the quality control body.

Note 1. Under special circumstances, e.g. small production sites with only limited production, it may be suitable to announce the visit.

For production sites with an annual production of treated wood according to NWPC Document No 1, Part 1 of a maximum of 7.000 m<sup>3</sup> only *one* inspection per year is normally carried out. The second inspection can be replaced by a procedure where the sampling is carried out by the treater and the samples are sent to the quality control body for analysis and evaluation. However, this requires that the production site during two consecutive years with four inspection visits have had approved results for all wood commodities and protection classes applicable for the site. If the production site at any inspection (visit or for samples sent) does not comply with the requirements in NWPC Document No 1, Part 1, two inspection visits per year shall again be carried out during the following two years.

The same applies with respect to major deviations from the marking of the treated wood and the factory production control and any particular national requirements.

Note 2. With particular national requirements is understood e.g. special requirements on marking according to national authority.

During the inspection, the inspector shall:

- Check that factory production control and treatment records are carried out continuously according to given instructions
- Check the plant's equipment for factory production control, mainly equipment for measuring the concentration of the treating solution (if applicable), manometers (pressure, vacuum) and the wood moisture content meters
- Take samples of the wood preservative solution (and/or concentrate, if applicable) for chemical and/or physical analysis to check the concentration in case the preservative is mixed on site and to check that the preservative formulation complies with that approved by the NWPC
- Take random samples from the treated wood for analysis of the preservative penetration and retention
- Check that updated instructions required according to this Document are available, cf. section 6.3
- Check that requirements on delivery and marking are fulfilled

- Check that any particular national requirements are fulfilled.

The inspector cannot ask for information regarding conditions that are not specified in this or other NWPC documents.

After the inspection visit, a report (normally within 6 weeks) with the results of the analyses carried out, as well as any observations of importance, will be sent to the producer.

## 8.4 Change of preservative

Changing of preservative for any commodity is possible providing valid certificates for the commodity exists. It shall immediately be reported to the quality control body, cf. 6.8.

If certificates are not valid, the producer must within 30 days from the change submit 13 samples from a batch consisting of 501-3 200 sampling units for testing of penetration and retention.

If the certificate is not valid for a specific commodity, the quality control body shall carry out an extra inspection within 30 days from date of the reported change.

## 9 Marking

### 9.1 General

Producers affiliated to third party quality control have the right and obligation to brand the products with the NWPC quality marks.






Wood protection class	NWPC quality mark	Bundle/package marking
NTR M		Blue
NTR A		White
NTR A pole		White
NTR AB		Yellow
NTR B		Red

Figure 9.1 NWPC quality marks and related colour codes for preservative-treated wood.

Design and proportions shall comply with the images above and the size shall be adapted to the product to be marked.

### 9.2 Implementation

Marking must be done either as bundle marking or as branding each item. In case of NTR class A and NTR A pole each item must be individually marked.

Individual marking is done directly on the treated item with the NWPC quality mark or alternatively by colour code on the end grain according to Figure 9.1.

Exception from these requirements is permitted.

Note. Examples are fence posts and sleepers.

Bundle marking shall at least contain the following information, cf. Figure 9.2:

- Treatment according to NWPC Document No 1, Part 1, and EN 351-1
- Name of wood preservative used and active ingredients declaring it is a biocidal product;
- Wood protection class and penetration class according to EN 351-1: NP 5 for classes NTR M, NTR A, NTR A pole and NTR AB, NP 3 for class NTR B
- Intended end use(s) for the treated wood
- Against which wood destroying organisms protection is given
- Wood preservative retention (refer to NWPC list of approved wood preservatives)
- Charge number of production
- Name and contact details of the producer

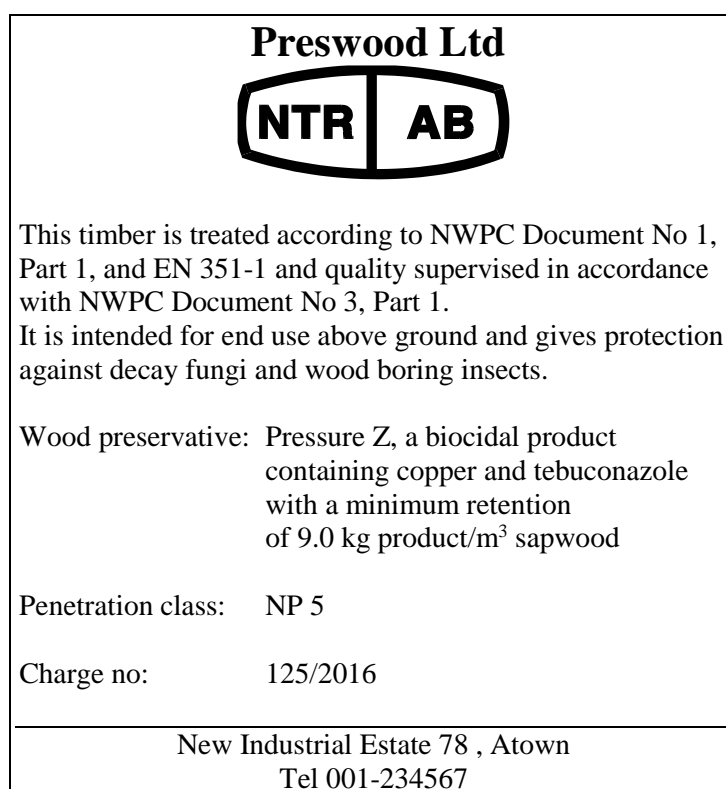


Figure 9.2 Example of bundle marking.

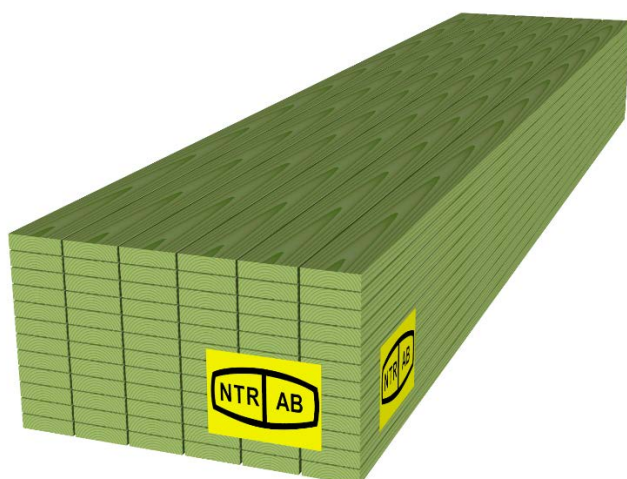


Figure 9.3 Example of location of bundle marking.

The quality marks may also be used on invoices, letterheads, promotion leaflets etc.

Delivery documentation (e.g. delivery note) shall always contain information on the wood preservative used and wood protection class. If pre-printed on invoices, delivery notes etc. that the wood delivered is treated according to the requirements in NWPC Document No 1, Part 1, it must be clearly stated if the wood is treated according to another specification to avoid misunderstanding.

Producers treating wood according to NWPC Document No 1, Part 1, and certified for CE-marking may also use the CE-mark to mark each item, or for bundle marking.

## 10 Guidelines for sanctions

### 10.1 General

Before any sanctions are carried out, it shall be considered whether there are extenuating or aggravating circumstances.

### 10.2 Sanctions if the penetration/and or the retention is not approved

If the penetration and/or the retention are not approved at third party control for one or more classes and commodities, the following procedure shall be carried out:

1. The quality control body informs the producer in the inspection report that the samples have sub-standard penetration and/or retention. Normally, the producer has two weeks after receiving the report to inform the quality control body what action to be taken to improve the penetration and/or retention in the future. Additionally, the producer shall send at least 13 cross-sections or 20 borings of the newly produced NTR classes sampled according to Annex 1 or Annex 2 of this Document for new analysis.

Note 1. In order to find the reasons for non-conforming retention, a sample of the treating solution can also be taken for analysis.

2. If the penetration and/or the retention are still not conforming to the requirements after analysis of the samples sent by the producer, an extra inspection shall be carried out, normally within one month.

3. If the penetration and/or the retention at this extra inspection do not comply with the requirement, the right to mark is normally withdrawn for the commodity (e.g. poles, fence posts) or class.
4. If more than two months have passed since withdrawal of the right to mark for a commodity or class, or more than four months have passed since the quality control body reported inadequate penetration and/or retention at an ordinary inspection, and no action has been carried out, the right to mark will be withdrawn for all commodities and classes and the producer will be suspended from the third party control.
5. The NWPC Technical Expert Group shall be informed if the quality control body observes consistent problems to comply with the penetration and/or retention requirements during the inspections.

Note 2. As an example, this may be obvious problems with a particular wood preservative to comply with penetration/retention requirements.

### **10.3 Sanctions if the formulation of the wood preservative does not comply with the nominal formulation**

If the formulation of the wood preservative does not comply with the nominal specification or tolerances allowed for chemical composition and/or physical properties, see NWPC Document No 1, Part 1, and clauses 11.6 and 12.6,

- The wood preservative manufacturer is contacted as soon as the inspection report is ready and asked for an explanation
- Depending on the circumstances, a new sample shall be taken and analyzed within two months after the producer's receipt of the inspection report
- If the formulation still does not comply with the tolerances, the right to mark will be withdrawn for the wood protection class two months after the producer has been informed.

### **10.4 Sanctions if factory production control, marking or national requirements are not following the requirements**

The subsequent procedures on sanctions must be followed if,

- The requirements regarding the factory production control are not met
- Marking according to this document is missing or incorrect
- Any particular national requirement is not met

The quality control body informs the producer in the inspection report if one or more of the above mentioned requirements are not met. Normally, the producer has two weeks after receiving the report to inform the quality control body what action to be taken to meet the requirements again.

If the remark still exists at the following ordinary inspection, an extra inspection is carried out, normally within one month to follow up on the action plan.

If no correction measures have been taken until the extra inspection, the right to mark will normally be withdrawn for the commodity (e.g. poles, fence posts) or class.

If more than two months have passed since withdrawal of the right to mark for a commodity or class, or more than four months have passed since the quality control body reported inadequate factory production control, incorrect marking or deviations from compliance with particular national requirements, and no action has been carried out, the right to mark will be withdrawn for all commodities and classes and the producer will be suspended from the third party control.

## **10.5 Continuous violation of the requirements**

If at an ordinary inspection the producer has neglected to carry out the action with respect to remarks from previous inspections, the right to mark is withdrawn immediately and the producer will lose the certificate for that class.

## **10.6 Withdrawal of the right to mark the treated wood**

When the right to mark is withdrawn, the producer must not brand the timber with the NWPC quality marks. The right to mark can be withdrawn for a commodity (sawn timber, poles etc.), a single wood protection class (NTR M, NTR A, NTR A pole, NTR AB or NTR B) or all classes for which the producer is approved. The latter means that the producer is suspended from the third party control.

Withdrawal of the right to mark is reported to the producer and made public on the NWPC website [www.ntr-nwpc.com](http://www.ntr-nwpc.com).

## **10.7 Requirements to regain the right to mark the treated wood**

To regain the right to mark the treated wood the producer must inform the quality control body in writing what action has been carried out to correct the circumstances that caused the withdrawal of the right to mark. The quality control body will then carry out at least one inspection to check that the production complies with the quality requirements. If the production is approved, the producer will regain the right to mark.

## **10.8 Suspension from the quality control scheme**

Suspension from the quality control will take place, in addition to what is said in clauses 10.2, 10.3, 10.4, 10.6 and 10.7, if:

- The marking is misused
- The quality control body is prevented by the producer to carry out inspections
- The producer does not settle his account with the quality control body and/or the NWPC.

At suspension, the approval certificate and affiliation agreement are immediately withdrawn.

Suspension is reported to the producer and made public on the NWPC website: [www.ntr-nwpc.com](http://www.ntr-nwpc.com).

## Annex 1 (normative)

### 11 Third party control of the classes NTR M, NTR A, NTR A pole and NTR AB. Sampling, measuring, analysis and calculation of the wood preservative penetration and retention

#### 11.1 General

Sampling and analysis of wood treated with water-borne and organic solvent type wood preservatives are based on guidelines in EN 351-2. For creosote treated wood the guidelines in EN 12490 apply.

Samples of treated wood and wood preservative/treating solution shall be adequately marked to secure traceability during further processing.

#### 11.2 Selection of batch

For the selection of batch, the following shall be considered:

- The batch shall be selected from wood treated since the latest inspection.
- The batch shall be selected in such a way that the subsequent sampling of units is representative for the batch
- A batch can consist of one charge or of several charges treated according to the same specification but at different occasions
- A batch shall consist of sampling units from the same commodity
- If sampling is carried out from the same commodity manufactured at different plants at the same production site, the batch should be selected in such a way that commodities from the different plants are represented in the batch.

In the report from the inspection, the selection of batch shall be described.

#### 11.3 Sampling for determination of wood preservative penetration and retention

##### 11.3.1 General

Samples must be taken at random from the selected batch after appropriate conditioning.

The number of samples is determined according to the number of sampling units of the batch, see Table 11.1 and Table 11.2 for poles and piles. These tables are based on the sampling procedure in EN 351-2 (ISO 2859-1) with AQL = 10 % and AQL = 6,5 % for NTR A pole at inspection level S3.

Table 11.1 Number of samples to be taken from batches of different sizes for all commodities except for poles and piles.

Batch size	Number of samples to be taken from the batch
5* - 150	5
151 – 500	8
501 – 3 200	13
3 201 – 35 000	20
35 001 – 500 000	32
> 500 000	50

\* If the batch consists of less than 5 units, every piece of timber shall be subject to sampling.

Table 11.2 Number of samples to be taken from batches of different sizes of poles and piles

Batch size	Number of samples to be taken from the batch
51 - 500	8
501 - 3200	13
3201 - 35000	20
35001 - 500000	32

Note. The same number of samples may be used for the factory production control of single charges with respect to the penetration.

Sampling units consisting of heartwood alone must be avoided. If in doubt, the boundary between heartwood and sapwood may be established with a heartwood reagent.

Test samples shall be taken from clear, straight-grained wood, away from splits, checks and other defects and at least 100 mm away from knots in a longitudinal direction midway between ends or at least 500 mm from the end grain.

Test samples shall be taken as borings or cross-sections as appropriate, see clauses 11.3.2 and 11.3.3.

When borings are taken from poles, they should be taken above the point that will be in ground contact.

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 adjacent to each other per sampling unit for separate determination of penetration and retention.

When sampling is carried out by borings, there is a need for a certain minimum mass for determination of the retention. Therefore, more than one boring taken adjacent to each other and at the same distance from the end grain may have to be sampled. The same number of borings shall then be taken from all sampling units involved.

### 11.3.2 Cross-sections

Cross-sections shall be at least 70 mm long. From these, test samples with a thickness of 5 mm are cut for analysis.

### 11.3.3 Borings

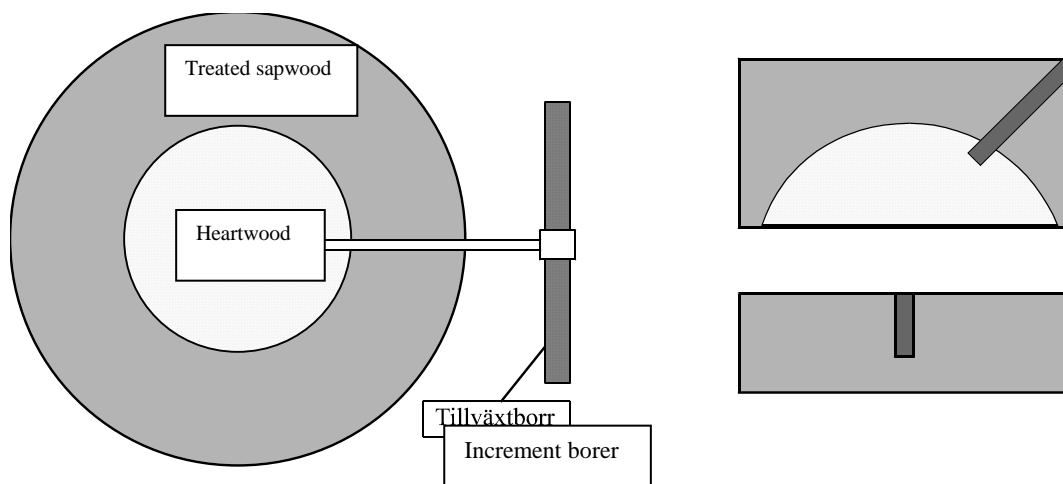


Figure 11.1 Example of sampling from round-wood and sawn timber.



Borings shall be taken from poles, piles and railway sleepers.

The increment borer shall be sharp and have an inner diameter of at least 4 mm.

Borings shall be taken in radial direction to such a depth that heartwood is also included, see Figure 11.1. If any part of the sample is lost the whole sample shall be rejected and a new one taken. If the requirement is for complete penetration, it is necessary for the borer to penetrate to the geometrical centre of the cross-section.

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

#### 11.4 Determination of the penetration of wood preservative

The penetration of wood preservative shall be determined for each sampling unit taken from the batch.

The penetration shall be determined visually. If in doubt, suitable reagents or specialized techniques shall be used to determine the penetration of preservative, see Annex 3.

Sometimes small zones of the sapwood, so-called transition wood, close to the heartwood cannot be treated. These zones, applicable to maximum two annual rings, shall be ignored for the purpose of assessing sapwood penetration.

The penetration is judged as complying or not complying with the penetration requirement, i.e. full sapwood penetration.

The penetration is approved if a maximum of 10 % of the samples, and a maximum of 6.5 % for poles, of a batch have insufficient penetration. This means that according to the sampling procedure in clause 11.3.1 the maximum number with insufficient penetration allowed is shown in Table 11.3 and Table 11.4 for poles.

Table 11.3 The maximum number of samples that may have less than full penetration of the sapwood for all commodities but poles and piles.

Number of samples taken from the batch	Maximum number of samples with less than 100 % penetration in the sapwood
5*)	1
8	2
13	3
20	5
32	7
50	10

\* If the batch consists of less than 5 units, every piece of timber shall be tested. All samples must have full sapwood penetration.

Table 11.4 The maximum number of samples that may have less than full penetration of the sapwood for poles and piles.

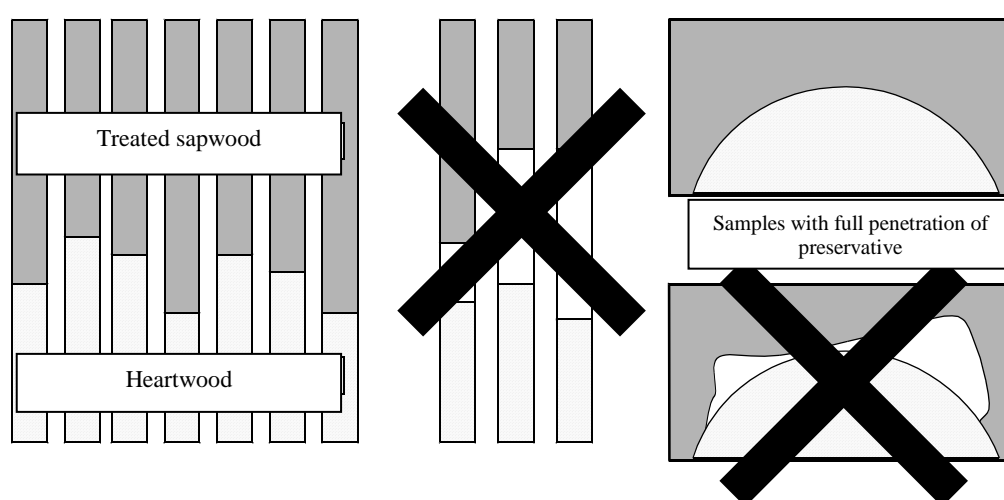
Number of samples taken from the batch	Maximum number of samples with less than 100 % penetration in the sapwood
8	1
13	2
20	3
32	5
50	8

## 11.5 Determination of the retention of wood preservative

The wood preservative retention shall be determined only for batches that comply with the penetration requirement. Thus, samples – cross-sections and borings – selected for the determination of retention shall be cut to include only the analytical zone with full penetration, see examples in Fig 11.2. From those samples a composite sample for analysis is prepared consisting of at least four samples.

Blooming on the surface of treated wood is removed before preparation for analysis.

The retention shall be determined by quantitative chemical analysis according to well-recognized methods or methods recommended by the wood preservative manufacturer. The expanded measurement uncertainty of the analytical methods shall be  $\leq 20\%$ . The analytical laboratory shall be able to give information on the measurement uncertainty and explain how it is established.



Samples with full penetration are only taken for chemical analysis.

Samples with insufficient penetration in the sapwood are not taken for analysis.

Figure 11.2 Sampling location of borings and cross-sections for analysis of the retention.

For determination of the retention, analytical data for at least one active ingredient will be used. The selection of active ingredient must be carried out with respect to which of the active ingredients that is present in the highest concentration. If analytical data for more than one active ingredient is used for calculation of the retention, the average of the analytical results obtained shall be used.

For each active ingredient the retention, expressed as  $\text{kg product/m}^3$  is calculated accordingly:

$$R_i = w_{s,i} \cdot \rho / w_{p,i}$$

Where,

$R_i$  is measured retention of product based on analysis of active ingredient  $i$ ,  $\text{kg/m}^3$ ,

$\rho$  is the wood density to be used in the retention calculations,  $\text{kg/m}^3$

$w_{s,i}$  is the mass fraction in the wood sample for active ingredient  $i$

$w_{p,i}$  is the mass fraction in the product for active ingredient  $i$

If the retention is calculated from more than one active ingredient an average product retention,  $R$ , for the batch is calculated accordingly:

$$R = \frac{\sum(R_i)}{n}$$

where

$R$  is measured retention of product for the batch, kg/m<sup>3</sup>

$R_i$  is measured retention of product based on each active ingredient  $i$ , kg/m<sup>3</sup>,

$n$  is the number of active ingredients  $i$  in the product used to calculate the retention,  $R$

If the density of the wood cannot be determined by accepted methods, a dry density of 480 kg/m<sup>3</sup> shall be used for pine sapwood (*Pinus sylvestris*). For other wood species, the average density according to EN 350, expressed as dry density, is used.

The retention of creosote is determined according to EN 12490. Freshly treated wood is excluded from the determination.

For comparison with the NWPC approved retention the analyzed and calculated retention shall be expressed with one significant decimal.

The retention is considered to be approved if the retention of the composite sample determined by analysis (kg/m<sup>3</sup>/sapwood) is at least the retention approved by the NWPC for the wood preservation class in question and in accordance with NTR Document No 1 part 1.

## 11.6 Sampling and analysis of wood preservative and treating solution

Wood preservatives used at each production site shall be analyzed by the quality control body annually with respect to the compliance with specifications and tolerances of active ingredients and, if applicable, physical properties.

Sampling from wood preservative and treating solution shall be carried out according to EN 212.

The active ingredients of water-borne and organic solvent type wood preservatives shall be analysed with respect to well-recognized, quantitative chemical methods of analysis or methods recommended by the wood preservative manufacturer.

The result of the analysis shall be in accordance with the composition stated in the NWPC approval certificate and with tolerances according to Table 11.5.

Table 11.5 Tolerances for active ingredients in wood preservatives.

Nominal content of active ingredient (a.i)		Tolerance, percentage of nominal content
% (m/m)	% m/m	%
0	< a.i ≤ 1,0	± 20,0
1,0	< a.i ≤ 2,5	± 15,0
2,5	< a.i ≤ 10,0	± 10,0
10,0	< a.i ≤ 25,0	± 6,0
25,0	< a.i ≤ 50,0	± 5,0
50,0	< a.i ≤ 100,0	± 2,5

For creosote, analyses shall be carried out according to methods stated in EN 13991. Results of analysis shall comply with requirements in that standard.

## Annex 2 (normative)

# 12 Third party control of class NTR B. Sampling, measuring and calculation of the wood preservative penetration and retention

## 12.1 General

The sampling is based on guidelines in EN 351-2.

Samples originating from the producers own timber shall be used, e.g. discarded components from the regular production. The samples should be at least 300 mm long.

Samples of treated wood and wood preservative/treating solution shall be adequately marked to secure traceability during further processing.

## 12.2 Selection of batch

See clause 11.2.

## 12.3 Sampling for determination of wood preservative penetration and retention

### 12.3.1 General

See clause 11.3.1.

### 12.3.2 Cross-sections

The cross-sections must be at least 40 mm long. From these, cross-sections with a thickness of 5 mm are cut for analysis, see Figure 12.1.

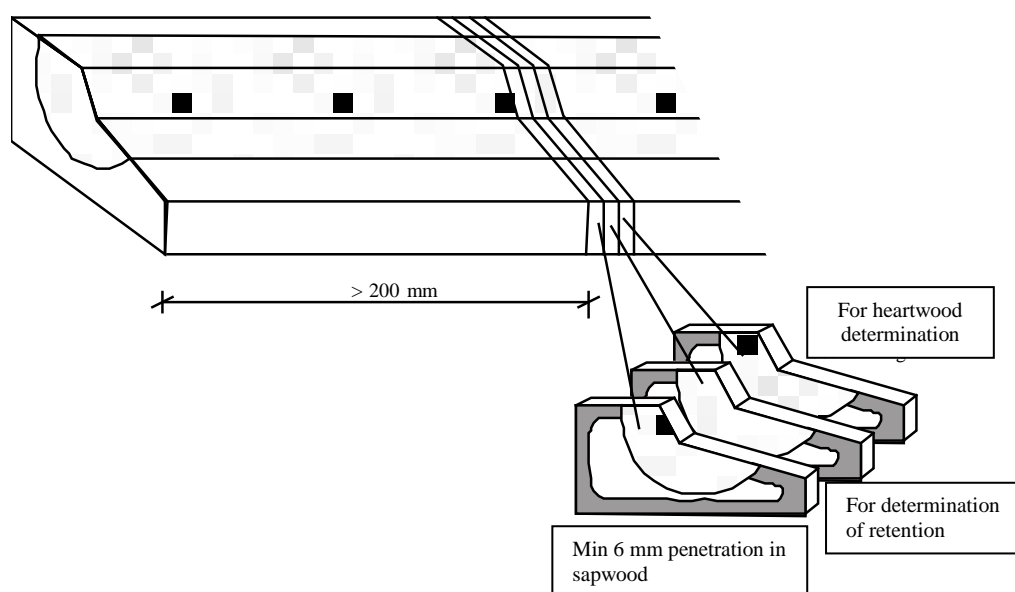


Figure 12.1 Determination of lateral penetration for wood protection class B.

## 12.4 Determination of the penetration of wood preservative

The penetration of wood preservative shall be determined for each sampling unit taken from the batch.

The penetration shall be determined visually. If in doubt, suitable reagents or specialized techniques shall be used to determine the penetration of preservative, see Annex 3.

The penetration is judged as complying or not complying with the penetration requirement, i.e. full sapwood penetration in the outer 6 mm zone. The penetration is approved if a maximum of 10 % of the samples of a batch have insufficient penetration. This means that according to the sampling procedure in clause 11.3.1 the maximum number with insufficient penetration allowed is shown in Table 11.3

## 12.5 Determination of the retention of wood preservative

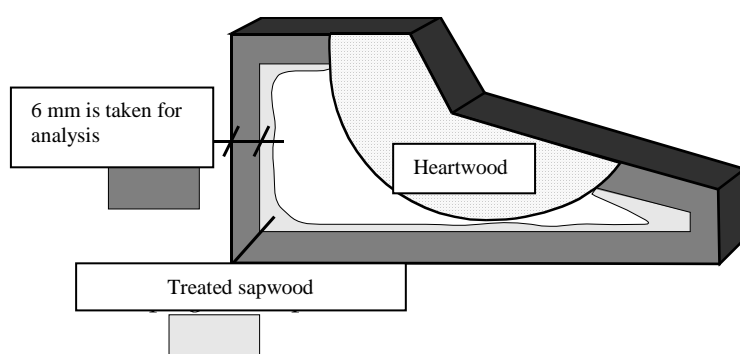


Figure 12.2 Sampling for retention analysis.

Same procedure as described in 11.5 is applied with the exception that samples selected for the determination of retention shall be cut to include only the 6 mm analytical zone with full penetration, see examples in Fig 12.2.

## 12.6 Sampling and analysis of wood preservative and treating solution

See clause 11.6.

## **Annex 3 (informative)**

### **13 Reagents to establish the presence of heartwood of pine and copper**

#### **13.1 Reagent for heartwood of pine**

Solution A: 400 g sodium nitrite ( $\text{NaNO}_2$ ) dissolved in 600 ml water

Solution B: Saturated solution of sulfanilic acid ( $\text{C}_6\text{H}_7\text{NO}_3\text{S}$ ) in water.

Equal amounts of solution A and B are mixed and diluted with 5 parts of water to give the ready-to-use solution. The solution is stable few hours only.

The heartwood is coloured orange/red.

#### **13.2 Reagents for copper**

The following solutions may be used to establish the presence of copper:

##### Chrome azurol S:

0.167 % of Mordant Blue dye is dissolved in 1.67 % of sodium acetate solution.

The solution is sprayed on the surface of copper treated wood and areas where copper is present will turn blue.

##### Rubeanic acid:

Solution A: 1 part ammonium hydroxide ( $\text{NH}_4\text{OH}$ ) and 3 parts of water

Solution B: Saturated solution of rubeanic acid in ethanol (95 %)

The solutions have unlimited stability.

The treated wood is first brushed with solution A and then with solution B.

Copper containing parts will be coloured dark blue.

##### PAN:

Dissolve 0.05 % of 1-(2-Pyridylazo)-2-naphthol in methanol.

After spraying the solution on a wood surface containing copper, a deep red/magenta colour will develop.