

Nordic requirements for quality control of industrially protected wood

Part 4: Modified wood

NWPC Document No 3. Part 4:2017

Nordic Wood Preservation Council 2017

Part 4: Modified wood

Document valid from 1st May 2017

The original language of this Document is English.

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1 Background

2 Scope

This Document contains requirements for quality control of modified wood produced to comply with the requirements for the wood preservation classes A mod, AB mod, B mod, M mod according to definitions in NWPC Document No 1, Part 4.

Quality control bodies approved by the NWPC to carry out quality control of industrially protected wood may apply deviations from the requirements in this Document. The deviations must be clearly justified, limited in time and they have to be approved by the NWPC Technical Committee, following prompt preparation.

This Document is not intended for investigation of 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 approved by the NWPC can be acquired from the NWPC Secretariat, see www.ntr-nwpc.com.

3 References

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

NWPC Document No. 1 Nordic Wood Preservation Classes. Part 4. Modified wood

NWPC Document No. 2 Conditions for approval of industrially protected wood in the Nordic Countries- Part 4. Modified wood

EN 350-2 Durability of wood and wood-based products – Natural durability of solid wood
Guide to natural durability and treatability of selected wood species of importance in Europe

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

ISO 2859-1 Sampling procedures for inspection by attributes
Sampling schemes indexed by acceptable quality level (AQL) for lot-by-lot inspection

4 Quality control bodies

4.1 Approval

The NWPC Board approves quality control bodies to carry out quality control of modified according to NTR Document 3 part 4.

Application for approval shall be sent to 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 industry.

Control bodies doing inspection/audits should be accredited according to EN ISO IEC 17025 and laboratories doing analyses shall have accreditation according to EN ISO IEC 17065.

4.3 Termination

Termination 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 wood treated together in a single operation
Batch	Clearly identifiable collection of units of modified wood manufactured to conform to the same defined penetration and retention requirements, e.g. poles, fence posts, sawn and planed timber, etc.
Sampling unit	One unit (for example a pole, a board, a fence post) of modified 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 who wish to produce modified wood according to the requirements in NWPC Document No 1, Part 4, can for each of their production sites, seek affiliation to quality control according to this Document.

6.2 Equipment

The treatment plant shall be designed and equipped in such a way that the requirements for the requested wood modification class according to NWPC Document No 1, Part 4, can be fulfilled.

The plant shall always be equipped with:

- Instruments that can continuously monitor the process; e.g. process times, pressure, vacuum, temperature, concentration etc.
- Instrument to measure the moisture content in the timber before treatment. If this is an electrical device, the electrodes shall be insulated and min. 30 mm long and calibrated for measuring modified wood.
- Device to measure the weight percent gain (WPG) or other relevant parameters related to the treatment intensity of the wood modification treatment for each charge or other suitable instruments needed for the control of the modification treatment.

6.3 Instructions

There shall be written instructions for:

- The plant's operation and maintenance
- The factory production control
- Preparation of treating solution (if dilution is required)
- Fixation of the modified wood

6.4 Factory production control

Continuous factory production control shall be carried out according to clause 8.2 under the leadership 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 modified wood)
- Commodities and wood preservation classes to be comprised in the quality control
- Production equipment, treatment processes used, type of process control
- Equipment for factory production control
- Instructions, see clause 6.3.

6.6 Initial inspection

Before the plant can be affiliated to the quality control 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 an agreement between the producer and quality control body.

6.8 The producers' rights and obligations

When the requirements in this Document are satisfied, the producer has the right to produce classified, modified wood according to NWPC Document No 1, Part 4, as well as right and obligation to brand the treated wood with the NWPC quality marks.

The right to brand treated wood with the NTR mark is communicated in a certificate comprising wood protection class and modifying treatment. The certificate is invalid when subject to changes regarding wood protection class.

Treated wood produced according to other specifications shall be clearly branded with different marks.

The producer alone is responsible for the modified wood produced.

Any changes in connection with the production or plant operator in charge shall be reported in writing to the quality control body immediately.

All the costs in connection with approval, initial as well as annual inspections, analyses and license fees shall be paid by the producer according to rules of the quality control body.

For producers not belonging to the NWPC member countries, an annual fee as well as a royalty related to the production of wood treated according to NWPC Document No 1, Part 1, will be invoiced by the NWPC Secretariat. These fees are decided 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 modified wood

8.1 General

Quality control of modified 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 preservation class in NWPC Document No 1, Part 4.

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 4. Procedures for ensuring the raw material must be in place including records of the supplier, delivery time, quality grade, dimensions, quantity and moisture content of received timber. All observations regarding the raw material that may affect the production process or manufacturing of the products in compliance with the requirements must be recorded.
- Checking the concentration of the treating solution (when applicable) before treatment
- Selection of a suitable process as well as monitoring the process. Process parameters must be stored electronically or on paper.
- Checking the result of the treatment, i.e. penetration and retention of the modifying agent shall comply with the requirements in NWPC Document No 1, Part 4. Other treatment such as e.g. thermal modification must be checked using a method instructed by the producer of the modified wood.
- Checking that the delivery requirements are fulfilled
- Recording the treatment
- 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 a minimum of information accordingly:

- Date and charge number
- Wood species, commodity and quantity
- Wood protection class or other treatment specification
- Highest and lowest moisture content measured before treatment when applicable
- Wood modifying agent, concentration (if diluted) of treating solution and temperature or pressure if heating or steam is part of the process
- Process (duration, pressure, temperature, vacuum, etc.)
- Uptake of treating solution/modifying agent for each charge (WPG, litre/m³ total volume of wood)
- Result of factory production control (number of samples/number approved)

Note Treatment records may be stored 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 five years.

8.3 Third party control

The aim of the third party control is to ensure that the factory production control is carried out and to check that the quality of the modified wood complies with the requirements in NWPC Document No 1, Part 4.

The third party control shall be carried out through at least two unannounced visits during one calendar year as decided and carried out by the control body.

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

During the inspection the inspector must:

- 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 and the wood moisture content
- take a sample of the modifying agent for chemical and/or physical analysis if applicable
- take random samples from the treated wood for analysis of the penetration, WPG, colour, weight loss, or other relevant parameters related to the treatment intensity.
- check that updated instructions required according to this Document are available
- check that requirements for 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, a report with the results of the analyses carried out, as well as any observations of importance, will be sent to the producer.

9 Marking

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 mod		Blue
NTR A mod		White
NTR AB mod		Yellow
NTR B mod		Red

Figure 8.1 NWPC quality marks and related colour codes for modified wood.

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

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

Delivery documentation (e.g. delivery note) shall always contain information on wood preservative used and wood preservation 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 4, it must be clearly stated if the wood is treated according to another specification to avoid misunderstanding.

Bundle marking shall at least contain the following information, see Figure 8.2:

- Treatment according to NWPC Document No 1, Part 4, and EN 351-1
- Name of wood modifying agent or modification system
- Wood protection class and penetration class according to EN 351-1: NP 5 for classes M mod, A mod and AB mod, NP 3 for class B mod
- Weight percent gain of the modifying agent where relevant (refer to NWPC list of approved wood preservatives)
- Other relevant parameters related to the treatment intensity (e.g. temperature, duration etc.)
- Charge number and year
- Name of the producer

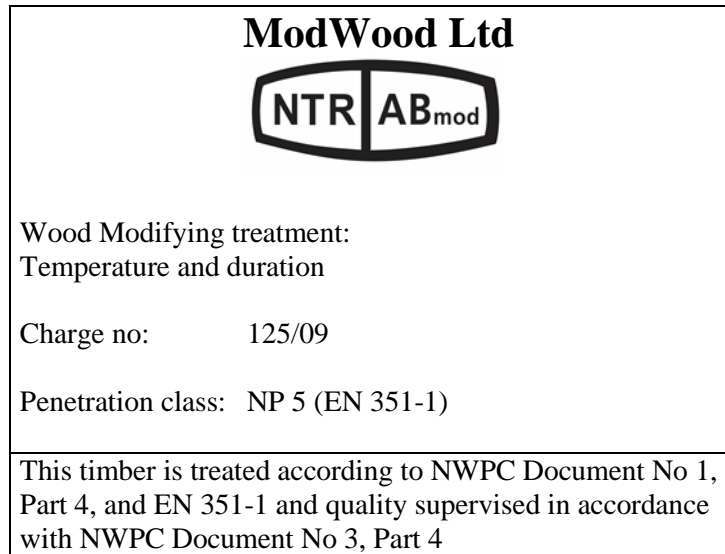


Figure 8.2 Example of bundle marking.

Colour code may be used to brand each piece of the treated wood as an alternative to using the quality mark, see Figure 8.1.

Producers treating wood according to NWPC Document No 1, Part 4, and certified for CE-marking may also use the CE-mark to mark each piece, 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 requirements on inspected parameters is not approved

If the requirements (e.g. penetration, retention (WPG), colour etc.) are not approved at third party control for one or more classes, the following procedure shall be carried out:

1. The control body informs the producer in the inspection report that the samples have a non-conforming inspected parameter. Normally the producer has two weeks after receiving the report to inform the control body what action he will take to improve the process.
2. The control body informs the producer in the inspection report that the samples have a non-conforming parameter. Normally the producer shall within two weeks after receiving the report send at least 13 cross-clauses or 20 borings of the non-conforming commodity(-ies) or class/-es for analysis.
3. If the retention is still not conforming to the requirements after analysis of the samples sent by the producer, an extra inspection is normally carried out within one month
4. If the penetration at this extra inspection does not comply with the requirement, the right to mark is normally withdrawn for the commodity (e.g. poles, fence posts) or class.
5. 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 control body reported sub-standard penetration 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.

6. The NWPC Technical Committee shall be informed if the control body observes consistent problems to comply with the requirements during the inspections.

10.3 Sanctions following other remarks

- If marking according to this Document is missing or incorrect
- If the requirements regarding the factory production control are not met
- If any particular national requirements are not met, then
 1. a remark thereof will be noted in the inspection report.
 2. the remark will be followed up at the next ordinary inspection. If no action has been taken by the producer, the producer shall notify the control body in writing within 14 days after receipt of the inspection report of any action to be taken to meet the requirements again.
 3. if the remark still exists after the extra inspection, another extra inspection is carried out within two (2) months to follow up the action plan.
 4. if no correction measures have been taken until the extra inspection, the right to mark is withdrawn for the commodity (e.g. poles, fence posts) or class.

10.4 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 is suspended from the third party control.

10.5 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 (M mod, A mod, AB mod or B mod) 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.

10.6 Requirements to regain the right to mark the treated wood

To regain the right to mark the treated wood the producer must inform the control body in writing what action has been carried out to correct the circumstances that caused the withdrawal of the right to mark. The 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.

10.7 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, 10.6 and 9.7, if:

- the marking is misused
- the control body is prevented by the producer to carry out inspections
- there are circumstances that can have the effect that authorities or the public lose their confidence in the control scheme and /or the control body
- the producer does not settle his account with the control body.

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.

Annex 1 (normative)

11 Third party control of the classes M mod, A mod and AB mod: Sampling, measuring and calculation of the modifying treatment involving either chemical or physical treatment

11.1 General

Sampling and analysis of modified wood are based on guidelines in EN 351-2.

Samples of modified wood 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 modified since the latest inspection.
- 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.

11.3 Sampling for determination of the parameters to be inspected

11.3.1 General

Samples shall 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 10.1. These tables are based on the sampling procedure in EN 351-2 (ISO 2859-1) with AQL = 10 % and AQL = 6,5 % respectively at inspection level S3.

Table 11.1 Number of samples to be taken from batches of different sizes.

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.

Note The same sampling frequency may be used for the factory production control of batches.

Sampling units consisting of heartwood alone should be avoided. If in doubt, the boundary between heartwood and sapwood may be established with a heartwood reagent, cf. Annex 3. This is not applicable for some modification systems; e.g. thermal modification.

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. Test samples shall be taken midway between ends or at least 500 mm from the end grain and as cross-sections as appropriate.

If the inspected parameter can be determined from a single test sample, only one test sample per sampling unit is necessary. Otherwise, two or possibly more test samples shall be taken adjacent to each other.

11.3.2 Cross-sections

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

11.4 Determination of modification “penetration” of the wood

The penetration of wood modifying agent shall be determined for each sampling unit taken from the batch. The penetration is either full, after appropriate determination, or insufficient.

The penetration shall be determined visually if applicable or other suitable method. If in doubt, suitable reagents shall be used to determine the penetration of agent, 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 approved if a maximum 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 is shown in Table 11.2, and Table 11.3 for poles.

Table 11.2 The maximum number of samples that may have less than full penetration of the sapwood.

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.

Table 10.3 The maximum number of samples that may have less than full penetration of the sapwood for poles.

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	4

All samples must have full sapwood penetration.

11.5 Determination of modification retention or intensity

The retention or intensity of the modification shall be determined for samples from a batch of modified wood by quantitative chemical analysis according to well-recognized methods or methods recommended by the producer of the wood modification system in question.

Blooming or the like on the surface of modified wood shall be removed before analysis. The composite sample shall consist of at least four samples. Samples with insufficient penetration in the sapwood are not taken for analysis.

For chemical modified wood the determination of the retention, analytical data for at least one chemical ingredient can be used if it is not possible to measure directly. The selection of the chemical agent must be carried out with respect to which of the ingredients that can be determined with the highest accuracy and precision. For chemical modified or other modification methods (e.g. heat treatment) other methods such as Moisture Exclusion Efficiency (MEE), weight percent gain (WPG) or colour changes of the treated wood that correlates with the actual modifying process can be used after appropriate validation.

If the density of the wood cannot be determined by accepted methods, a dry density of 480 kg/m³ shall be used for pine sapwood (*Pinus sylvestris*). For other wood species, the average density according to EN 350-2, expressed as dry density, is used.

The retention is considered to be approved if the retention or the indirect measurement of the composite sample is at least at the level approved by the NWPC for the wood preservation class in question.

11.6 Sampling and analysis of wood modifying agent and treating solution

In case of a wood modifying agent is used it shall be analyzed by the control body annually if applicable at each production site. Well-recognized, quantitative chemical methods of analysis or methods recommended by the producer of the modified wood must be used. The result of the analysis shall be in accordance with the composition stated in the NWPC approval certificate.

Annex 2 (normative)

12 Third party control of class B mod. Sampling, measuring and calculation of the wood modifying treatment or the physical treatment

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.

12.2 Selection of batch

See clause 11.2.

12.3 Sampling for determination of 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, clauses with a thickness of 5 mm are cut for analysis, see Figure 12.1.

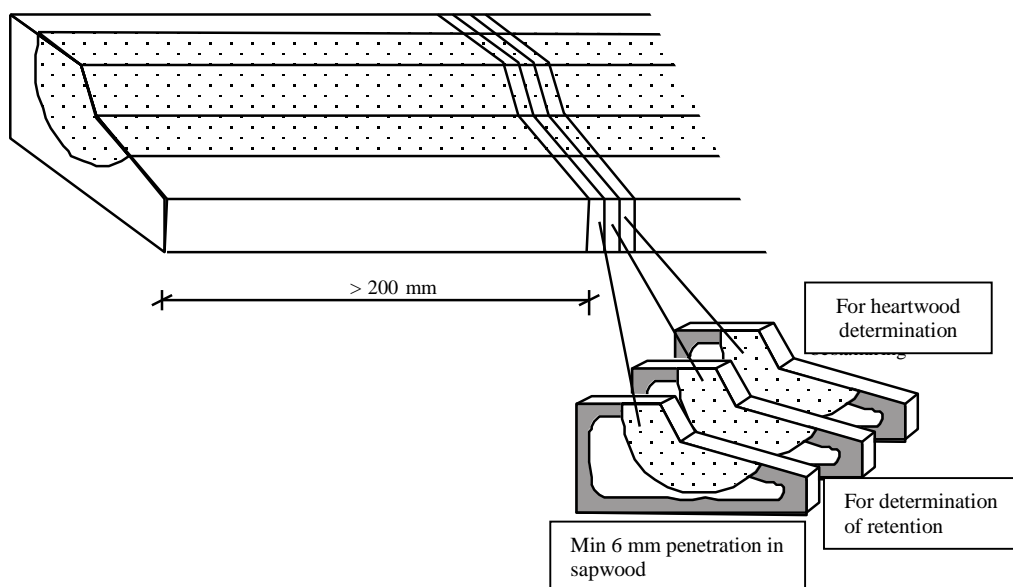


Figure 12.1 Determination of lateral penetration for wood preservation class B.

12.4 Determination of the penetration of the modifying agent or physical treatment

The penetration or depth of wood modification system shall be determined for each sampling unit taken from the batch. The penetration is either full in the outer 6 mm zone or insufficient.

The penetration shall be determined visually, chemically or physically. Visually means that suitable reagents recommended by the producer of the wood modification system in question may be used to determine the penetration of the modification agent in the outer 6 mm zone. Chemical analysis specified by the manufacturer or physical methods such as MEE may also be used.

The penetration, MEE or similar is approved if maximum 10 % of the samples of a batch have lower levels than approved by the NWPC. This means that according to the sampling procedure in clause 11.3.1 the maximum number with insufficient penetration is shown in Table 11.2.

12.5 Determination of the retention of the modifying agent or the depth of the physical treatment

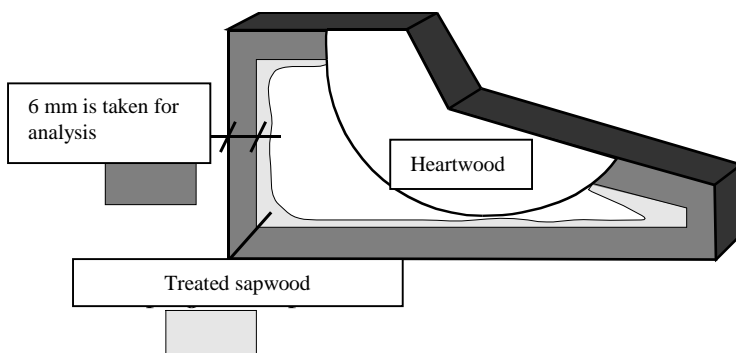


Figure 11.2 Sampling for retention analysis.

The retention shall be determined for samples from a batch by quantitative chemical analysis according to well-recognized methods or methods recommended by the manufacturer of the modified wood (e.g. colour, MEE, etc.).

Blooming or the like on the surface of modified wood shall be removed before analysis.

Only samples with full sapwood treatment in the outer 6 mm zone shall be analysed. The composite sample shall consist of at least four samples.

For determination of the retention of a chemical modifying agent, analytical data for the modifying agent will be used. The selection of chemical method must be specified by the producer with respect to the highest accuracy and precision.

Other indirect methods may be used for the determination of retention based on the expected mode of action. This includes MEE (moisture exclusion efficiency, volume increase etc.). This must be specified by the producer and the method must be validated and presented to NTR-T.

If the density of the wood cannot be determined by accepted methods, a dry density of 480 kg/m³ shall be used for pine sapwood (*Pinus sylvestris*). For other wood species, the average density according to EN 350-2, expressed as dry density, shall be used.

The retention or other inspected parameter is considered to be approved if the composite sample determined by analysis (kg/m³/sapwood) is at least the value approved by the NWPC for NTR B mod.

12.6 Sampling and analysis of wood modification agent and treating solution

See clause 10.6.

Annex 3 (informative)

13 Reagents to establish the presence of heartwood

13.1 Reagent for heartwood of pine

Solution A: 400 g sodium nitrite (NaNO_2) dissolved in 600 ml water

Solution B: Saturated solution of sulphanilic 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.