NTR classified preservative-treated laminated wood

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NTR classified preservative-treated glued laminated timber products – classes and guidance on third party quality control with focus on sampling for analysis of preservative penetration and retention

Background

In recent years an increasing interest has been shown by producers of glued laminated timber products as well as by building material suppliers to offer NTR-classification.

The present version (2017) of NWPC Document No 1 does not include such products. However, EN 351-1 and previous versions of Document No 1 (dated 2011 and 2013) did actually include glued laminated timber, providing it satisfied penetration and retention requirements.

The NWPC has taken an initiative to formally include glued laminated timber products again in the NTR system for preservative-treated wood. The present document shall be regarded as supplementary to NWPC Documents No 1, part 1 (2017) and NWPC Document No 3, part 1 (2017).

Scope

This Document defines wood preservation classes and corresponding product requirements for glued laminated products, i.e. solid timber (Duolam) and glued laminated timber (glulam) of pine (*Pinus* spp) and other permeable softwoods according to EN 350 preservative-treated with a water-borne wood preservative.

Permeable softwoods are those whose sapwood is classified in treatability class 1.

Laminated wood components for joinery products, such as window and door components are not part of this document.

The wood preservation classes refer only to the protection against biological deterioration. Any other quality and performance related requirements on untreated and treated laminations before glueing and treated components after glueing, such as wood quality grading, must be specified separately.

This Document also contains NWPC requirements for third part quality control of preservative-treated laminated timber.

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

Normative references

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

EN 335	Durability of wood and wood-based products. Use classes: definitions, application to solid wood and wood-based products
EN 350	Durability of wood and wood-based products - 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
NWPC Document No 1	Nordic wood protection classes and product requirements for industrially protected wood Part 1: Scots pine and other permeable softwoods
NWPC Document No 2	Conditions for approval of wood preservatives for industrial wood preservation in the Nordic countries Part 1: Scots pine and other permeable softwoods
NWPC Document No 3	Nordic requirements for quality control of industrially protected wood Part 1. Scots pine and other permeable softwoods

Wood preservation classes for glued laminated products

Raw materials

Wood

The wood quality shall comply with the glulam manufacturer's requirements.

All machining shall as far as possible be carried out before preservative treatment.

Drying and conditioning of the wood before treatment shall be carried out in such a way that the penetration requirements can be fulfilled and that the properties of the treated wood are not adversely affected with respect to intended end-use.

Wood preservatives

Wood preservatives shall be approved by the NWPC according to NWPC Document No 2, Part 1.

NOTE 1 European restrictions (Biocidal Products Regulation), e.g. a maximum retention level set for a wood preservative by a national environmental authority, may restrict the use of NWPC approved wood preservatives.

NOTE 2 A list of approved wood preservatives is available on the NWPC website www.nwpc.eu.

Adhesives

Adhesives used shall be suitable for the intended end-use situation.

Wood preservation class	**Applicable to glue laminated product**	**Treatment requirements**	
		Penetration class according to EN 351-1	**Retention of preservative**
NTR A	-Duolam -Glulam	NP 5 Full penetration of the sapwood	According to NWPC approval class A for the preservative in the analytical zone
NTR B-Glulam*	-Glulam	NP 3 Minimum 6 mm lateral penetration into the sapwood	According to NWPC approval class AB for the preservative in the analytical zone

General guidance on how to achieve compliance with the NTR classes

NTR class A

Compliance with the penetration and retention requirements can in principle be achieved either by treating assembled components or by assembling treated laminations.

By practical experience, as well as trials, it is well-known that it is impossible with wood species, such as Scots pine, to achieve full sapwood penetration of glulam components consisting of more than two laminations, see typical examples in Figure 1.

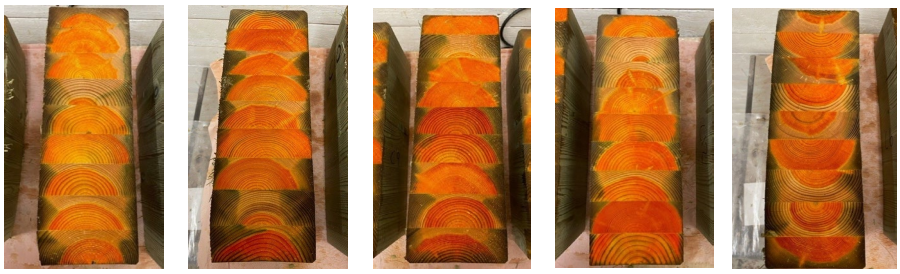


Figure 1. Difficulties to comply with NTR A and NTR AB penetration requirement of full sapwood when treating after assembling.

Even with two (duolam) and three laminations considerable difficulties may exist, but a carefully managed process adapted to the wood material and the plant's technical equipment will increase the possibilities for successful compliance with the requirements, see Figure 2.

For Duolam compliance with the penetration requirements may be facilitated by gluing heartwood face to face.

a. b.

Figure 2. a Duolam with with heartwood glued face to face.
b Glulam with three laminations successfully treated after assembling.

Difficulties to achieve the NTR A requirements by treating assembled components can be overcome by assembling individual laminations treated according to NTR A, Figure 3.

Depending on the intended end-use of the laminated product, subsequent planing may be needed. If so, and in order to maintain the NTR classification, **a final preservative** treatment **is required.**

NOTE. For the final preservative treatment the concentration of the treating solution should be prepared for NTR class A.

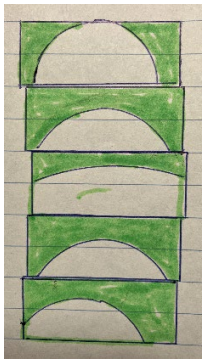


Figure 3. Glulam made of treated laminations.

NTR class B-Glulam

This class corresponds to NTR class B concerning the penetration requirement, i.e. minimum 6 mm into the sapwood, and class AB concerning the retention requirement.

No machining but cutting is allowed.

In practice this means a glulam product treated after assembling only.

No subsequent coating is required.

NTR class B-Glulam is restricted to Use classes 3.1 according to EN 335.

Third party control of laminated wood components. Guidance on sampling, measuring, analysis and calculation of the wood preservative penetration and retention

General

General requirements for third party quality control of preservative-treated wood classes NTR A and NTR B will be found in NWPC Document No 3, Part 1.

This document is focusing on special requirements applicable to preservative-treated laminated components.

It should be emphasized that a batch, see Definitions below, shall consist of sampling units from the same commodity. This means that a batch shall not consist of a mix of sawn timber, round timber and laminated components. Laminated components shall be treated separately.

Definitions

Definitions applicable to this document:

Charge	All the wood treated together in a single operation.
Batch	Clearly identifiable collection of units of preservative-treated laminated wood components manufactured to conform to the same defined penetration and retention requirements, e.g. Duolam, glulam.
Sampling unit	One unit (for example a Duolam post, a glued laminated beam taken from a batch of preservative-treated laminated wood components.
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.

Sampling for determination of wood preservative penetration and retention

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 the following Table.

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

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

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

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 longitudinal direction midway between ends or at least 500 mm from the end grain.

Test samples shall be taken as borings or cross-sections.

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 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.

Cross-sections

Cross-sections shall be taken from duolam and from glued laminated wood made of 3 laminations.

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

Borings

Borings shall be taken from glued laminated wood with minimum 4 laminations and taken at random from inner laminations, see Figure 4.

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

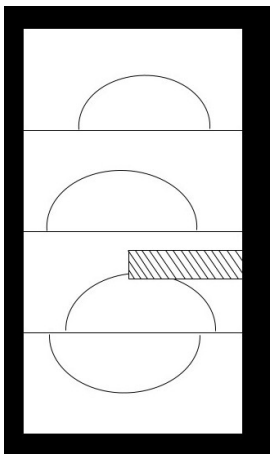


Figure 4. Boring taken from inner lamination.

Borings shall be taken perpendicular to the surface and laminations consisting of heartwood only should be avoided.

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

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.

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.

If the penetration is determined for cross-sections for which penetration class NP 5 apply, untreated zones not exceeding 10 % of the sapwood expected to be treated in each lamination shall be ignored in the assessment of penetration.

The penetration is judged as complying or not complying with the penetration requirement.

The penetration is approved if a maximum of 10 % of the samples of a batch have insufficient penetration. This means that the maximum number of samples with insufficient penetration allowed is shown in the Table below.

The maximum number of samples that may not comply with the penetration requirement.

Number of samples to be taken from the batch	**Maximum number of samples with less than 100 % penetration in the sapwood**
5*	1
8	2
13	3

* If the batch consists of less than 5 units, every piece of timber shall be tested. All samples shall comply with the penetration requirement

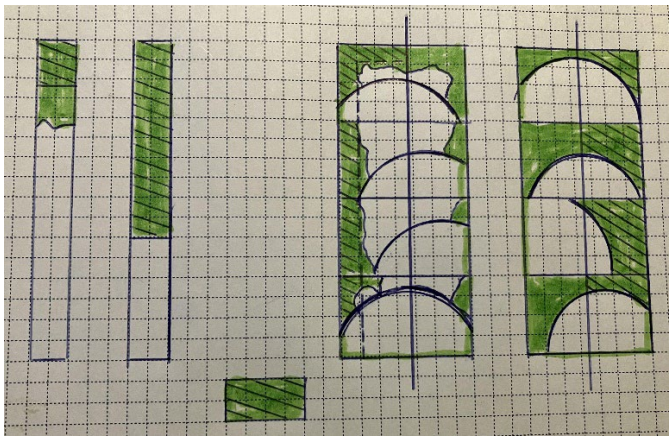
Determination of the retention of wood preservative

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 that complies with the penetration requirement. See examples in Figure 5.

For Duolam samples are selected from the laminations with the deepest sapwood depth, see Figure 6.

From those samples a composite sample for analysis is prepared consisting of at least four samples.

For further details concerning the chemical analysis of the wood samples, see NWPC Document No 3, Part 1.



a b

Figure 5. Sampling for determination of retention.

a. From borings
Left: Boring with a defined penetration
Right: Boring with full sapwood penetration

b. From cross-sections
Left: Cross-section with a defined penetration
Right: Cross-section with full sapwood penetration

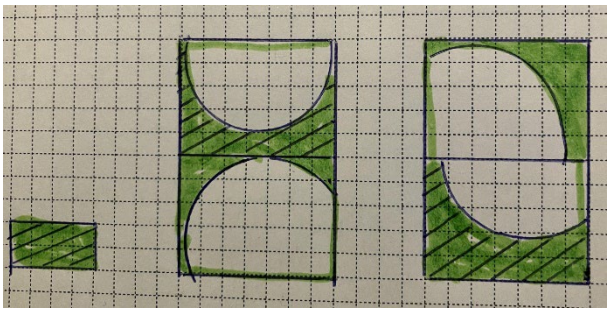


Figure 6. Sampling from Duolam for determination of retention.

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