NTR classified preservative-treated glued laminated timber – wood protection classes and guidance on third party quality control

2025-03-28

Background

In recent years an increasing interest has been shown by producers of glued laminated timber (glulam) 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 351-1:2023 does, and previous versions of Document No 1 (dated 2011 and 2013) did actually include glulam, providing it satisfied penetration and retention requirements.

The NWPC has taken an initiative to formally include glulam 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 protection classes and corresponding product requirements for glued laminated products, i.e. solid timber (Duolam) and 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 protection 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 party quality control of preservative-treated glulam.

This Document is not intended for investigation of preservative-treated glulam 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
EN 14080	Timber structures – Glued laminated timber and glued solid timber – Requirements
EN 15228	Structural timber — Structural timber preservative treated against biological attack
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

Raw materials

Wood

The wood quality shall comply with specifications relevant for the current manufacturing of glulam products. In case CE marking is required compliance with EN 14080 is needed.

Wood preservatives

Wood preservatives shall be approved by the NWPC according to NWPC Document No 2, Part 1. In case CE marking is required compliance with EN 15228 is also needed.

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 protection classes and treatment requirements for glulam

Wood protection classes and treatment requirements are shown in the scheme below.

Wood protection class	**Treatment requirements**	
	Penetration class according to EN 351-1	**Retention of preservative**
NTR A GL	NP 5 Full penetration of the sapwood	According to NTR Wood protection class A for the preservative in the analytical zone
NTR AB GL	NP 5 Full penetration of the sapwood	According to NTR Wood protection class AB for the preservative in the analytical zone
NTR B GL	NP 3 Minimum 6 mm lateral penetration into the sapwood	According to NTR Wood protection class AB for the preservative in the analytical zone

NOTE See also clause “Guidance on how to achieve compliance with the NTR wood protection classes” below.

Marking

NTR-certified producers of preservative-treated wood have the right and obligation to mark their products with the NWPC quality marks below.

If compliance with the treatment requirements is achieved by Dual treatment, it shall be indicated by using GL2 instead of GL.

Wood protection class	NWPC quality mark
NTR B GL	
NTR AB GL	
NTR A GL	

Guidance on how to achieve compliance with the NTR wood protection classes

General

Compliance with the requirements of the NTR wood protection classes can be achieved either by:

a) preservative treatment of the glulam product,
b) assembling of preservative-treated laminations; no subsequent planing of the glulam product,
c) assembling of preservative-treated laminations followed by planing and a second preservative treatment of the glulam product

Wood protection classes with full sapwood penetration -.NTR A GL and NTR AB GL

These classes correspond to classes NTR A and NTR AB concerning penetration and retention requirements. i.e. full sapwood penetration and retention in accordance with class requirement.

a) preservative treatment of the glulam product
No subsequent planing, machining or cutting are allowed. A subsequent superficial treatment is unnecessary.

If cutting cannot be avoided, saw cuts shall be liberally brushed with suitable preservative product.

NOTE 1. In practice not very common alternative owing to difficulties to comply with the penetration requirement. Possible to achieve with duolam with carefully adjusted drying and treatment processes.

b) assembling of preservative-treated laminations
Laminations shall comply with NTR requirements.
No subsequent planing, machining or cutting are allowed of the glulam product. A subsequent superficial treatment is unnecessary.

If cutting cannot be avoided, saw cuts shall be liberally brushed with suitable preservative product.

Alternative (b) complies with appearance class *Panel sawn* as defined in The Glulam Handbook Volume 1.

c) assembling of preservative-treated laminations followed by planing and a second preservative treatment of the glulam product.
Laminations shall comply with NTR requirements.
After planing a second preservative treatment (Dual-treatment), with a treating solution corresponding to the wood protection class, is required.
After the second treatment no subsequent planing, machining or cutting of the glulam product is allowed.

If cutting cannot be avoided, saw cuts shall be liberally brushed with suitable preservative product.

NOTE 2. The purpose of the second treatment is to ensure that any untreated wood, exposed as the result of the planing is sufficiently treated.

NOTE 3. Depending on the intended end-use, a final treatment with a water-repellent product may be considered.

Wood protection class with a defined, limited sapwood penetration -NTR B GL

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

a) preservative treatment of the glulam product
No subsequent planing, machining or cutting are allowed. A subsequent superficial treatment is unnecessary.

If cutting cannot be avoided, saw cuts shall be liberally brushed with suitable preservative product.

NOTE 4. In practice the most common way of treating glulam intended for protected above-ground exposure.

Example of end-uses for preservative-treated glulam

Preservative-treated glulam product is intended for use in applications where dry conditions, corresponding to Use Class 1 (interior, dry) or Use Class 2, cannot be reliably assured. It is also applicable in situations where there is a risk of biological attack is possible and where an extended service life is required due to limited accessibility for inspection or replacement, or where the consequences of structural failure are considered critical from a safety or operational perspective.

The classifications, service conditions and examples provided in the accompanying table are based on an assessment of biological durability requirements, assuming the glulam product is suitable for use in the intended end-use and exposure.

It is emphasised that exposure to moisture and water can significantly affect the mechanical properties of glulam. Such exposure, when occurring outside the glulam product intended service conditions, may compromise both the biological durability and the structural integrity of the product.

Examples of the use of glulam products in different service conditions, relevant for the use classes 3.1, 3.2 and 4 specified in EN 335 and NWPC Document No 1, part 1, are presented below.

Corresponding Use class according to EN 335	**Glulam service conditions**	**Examples**	**Recommended wood protection class**
3.1	Limited wetting conditions Glulam above ground but where high environmental humidity can lead to occasional but not persistent wetting. Consequences of failure will be small.	External – protected Trusses, columns, beams, construction elements.	NTR B GL
3.2	Prolonged wetting conditions Glulam above ground and either continually exposed to the weather or subject to frequent wetting. Relatively easy to replace damaged components. Consequences of failure will be moderate.	External – unprotected Garden timbers, trusses, columns, beams, playground equipment, construction elements.	NTR AB GL
4	Glulam in ground proximity or severely exposed to the weather. Glulam inaccessible for inspection or replacement. Consequences of failure will be particularly serious.	High-performance trusses, fence posts and columns on foundations, beams, construction elements, bridges.	NTR A GL

Third party control of glulam. Guidance on sampling, measuring, analysis and evaluation of the wood preservative penetration and retention

General

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

This document focuses on specific requirements for preservative-treated glulam.

It should be emphasized that a batch, see Definitions below, shall consist of sampling units from the same commodity. This means that glulam 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 glulam manufactured to conform to the same defined penetration and retention requirements.
Sampling unit	One unit (for example a Duolam post, a glulam 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 glulam shall be subject to sampling.*

NOTE 1. The batch size in the table is restricted to a maximum of 3 200 components.

NOTE 2. The same number of samples may be used for the factory production control of single charges with respect to the penetration.

For glulam made of preservative-treated laminations, classes NTR A and NTR AB, no sampling is required if sourced from plants under third-party control. Proper documentation, such as charge number and wood treater, shall be available.

Sampling is required if the manufacturing involves dual treatment.

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, sufficient mass of treated sapwood for determination of the retention has to be collected. 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.

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 glulam with minimum 3 laminations and taken at random from inner laminations, see Figure 1.

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

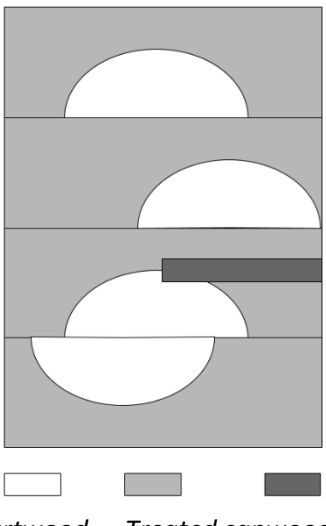

Figure 1. Boring taken from inner lamination.

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

NOTE. As laminations may have finger-joints, avoiding heartwood may cause some difficulties by just look at the end-grain before sampling.

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.

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 glulam 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 Figures 2 and 3.

For Duolam, samples are selected from the laminations with the deepest sapwood depth, see Figure 3.

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.

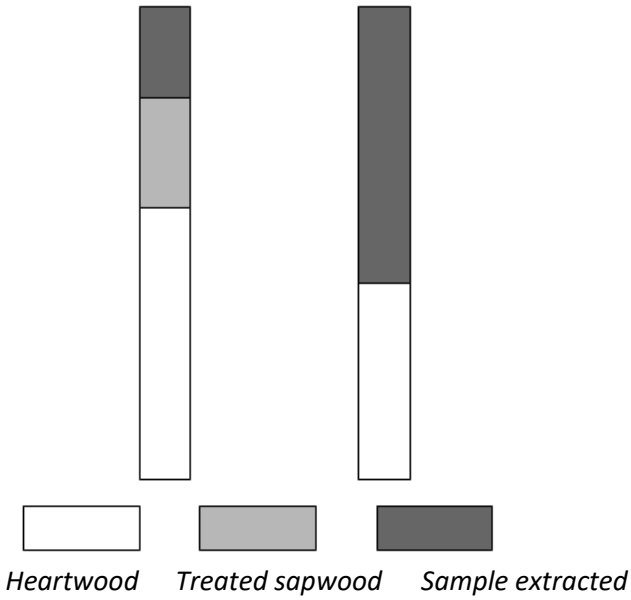

Figure 2. Sampling for determination of penetration and retention from borings.
Left: Boring with a defined penetration
Right: Boring with full sapwood penetration

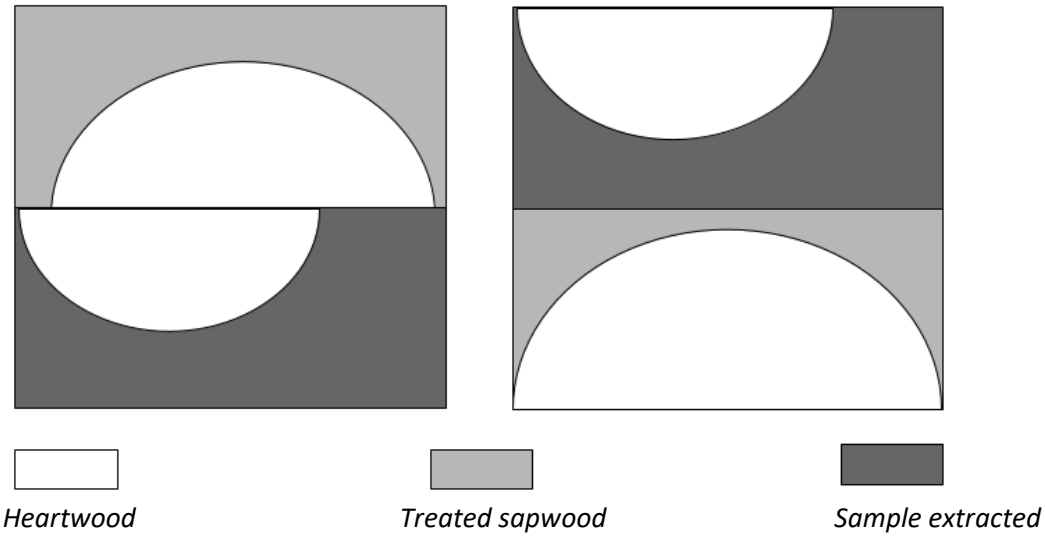

Figure 3. Sampling for determination of penetration and retention from cross-sections of duolam.

Bibliography

The Glulam Handbook Volume 1, 2024. Swedish Forest Industries Federation.

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