

## National Technical Approval (abZ)

Approval body for construction products and types of construction

Bautechnisches Prüfamt (Construction testing office)

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### Validity

from: **2 December 2013**  
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Applicant:  
**Pollmeier Furnierwerkstoffe GmbH & Co. KG**  
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99831 Creuzburg, Germany

Subject of the approval:  
**Glued laminated timber made from beech laminated veneer lumber**

The subject of the approval stated above is hereby granted national technical approval.  
This approval comprises ten pages.

This translation of the national technical approval has not been authorized by the DIBt.

## I GENERAL PROVISIONS

1. National technical approval confirms the suitability for use of the subject of the approval, as defined by the regional building regulations.
2. If the national technical approval stipulates specific knowledge and experience on the part of the persons entrusted with the fabrication of construction products and types of construction in accordance with the regional building regulations, pursuant to § 17 para. 5 of the Model Building Code, it should be noted that this knowledge and experience can also be verified by means of equivalent certificates from other Member States of the European Union. This also applies to equivalent certificates submitted within the scope of the Treaty on the European Economic Area or other bilateral agreements.
3. The national technical approval does not replace the approvals, consents and certifications prescribed by statute for the implementation of construction projects.
4. The national technical approval is issued without prejudice to third-party rights, especially private property rights.
5. Notwithstanding any further requirements specified in the "Special Provisions", the manufacturer and distributor of the subject of the approval shall provide the user of the subject of the approval with copies of the national technical approval and shall point out that the national technical approval must be available for reference at the place of use. On request, copies of the national technical approval must be provided to the relevant authorities.
6. The national technical approval may only be duplicated in full. For the publication of extracts, permission must be obtained from the Deutsches Institut für Bautechnik (German Institute for Civil Engineering).  
Text and drawings in advertising material must not contradict the national technical approval. Translations of the national technical approval must contain the following notice: 'Translation not checked by the Deutsches Institut für Bautechnik.'
7. The national technical approval can be revoked. The provisions of the national technical approval may be supplemented or amended at a later date, especially if new technical findings make this necessary.

## II SPECIAL PROVISIONS

### 1 Subject of the approval and area of use

#### 1.1 Subject of the approval

Glued laminated timber made from beech laminated veneer lumber in compliance with this national technical approval comprises at least three laminations made of laminated veneer lumber, made of European beech (*Fagus sylvatica* L.), which are glued together on their flat surface.

#### 1.2 Area of use

1.2.1 Glued laminated timber made from beech laminated veneer lumber in compliance with this national technical approval can be used for all timber components for which the use of solid timber or glued laminated timber is permitted in the standard DIN EN 1995-1-1<sup>1</sup> in conjunction with DIN EN 1995-1-1/NA<sup>2</sup>.

1.2.1 It may be used under the climatic conditions of service classes 1 and 2, as per DIN EN 1995-1-1.

1.2.3 The glued laminated timber made from beech laminated veneer timber must only be used for predominantly static loading (see DIN 1055-3:2006-03<sup>3</sup>, Section 3) or static or quasi-static actions (see DIN EN 1990<sup>4</sup> and DIN EN 1991-1-1<sup>5</sup> in conjunction with DIN EN 1991-1-1/NA<sup>6</sup>).

1.2.4 Glued laminated timber made from beech laminated veneer lumber that has been treated with chemical-based wood preservatives or fireproofing agents is not covered by this national technical approval.

### 2 Provisions for glued laminated timber made from beech laminated veneer lumber

#### 2.1 Required properties

##### 2.1.1 Laminations made of beech laminated veneer lumber

2.1.1.1 The laminations made of laminated veneer lumber of European beech (*Fagus sylvatica* L.) which are glued together must fulfil the following requirements:

- They must be manufactured from laminated veneer lumber "Beech LVL with longitudinal layers" in compliance with standard DIN EN 14374<sup>7</sup> in conjunction with National Technical Approval No. Z-9.1-838<sup>8</sup>.
- The characteristic density of the laminations of beech laminated veneer lumber must be at least 680 kg/m<sup>3</sup>.
- The laminations must be 40 mm ± 3 mm (finished size) thick and 50 mm to 300 mm wide.

1	DIN EN 1995-1-1:2010-12	Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
2	DIN EN 1995-1-1/NA:2013-08	National Annex - Nationally established parameters - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
3	DIN 1055-3:2006-03	Actions on structures - Part 3: Self-weight and imposed loads for buildings
4	DIN EN 1990:2010-12	Eurocode: Basis of structural design
5	DIN EN 1991-1-1:2010-12	Eurocode 1: Actions on structures - Part -1-1: General actions - Densities, self-weight and imposed loads for buildings
6	DIN EN 1991-1-1/NA:2010-12	National Annex - Nationally established parameters - Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight and imposed loads for buildings
7	DIN EN 14374:2005-02	Timber structures - Structural laminated veneer lumber – Requirements
8	Z-9.1-838	Laminated veneer lumber made of beech for the construction of bar-shaped and flat load-bearing structures "Beech LVL with longitudinal layers" and "Beech LVL with crosswise layers"

- The laminations must not have any finger joints in the longitudinal direction.

2.1.1.2 The laminations of the glued laminated timber made from beech laminated veneer lumber must fulfil the requirements stated in Table 1.

Table 1: Requirements regarding the characteristic bending and tensile strength of the laminations (in N/mm<sup>2</sup>) for glued laminated timber made from beech laminated veneer lumber

Requirements for the laminations	
Characteristic flatwise bending strength of the laminations $f_{m,l,k}$ in N/mm <sup>2</sup>	≥ 80
Characteristic tensile strength of the laminations $f_{t,0,l,k}$ in N/mm <sup>2</sup>	≥ 60

2.1.1.3 The glued wood surfaces must be planed or ground. The glued joint between the veneer layers must not be exposed. The planing or grinding must take place 6 h before gluing, at the earliest.

When the glue is applied, the timber moisture of the individual laminations must be 5 % ± 3 %.

## 2.1.2 Adhesive

Adhesives listed by the DIBt must be used for gluing the laminated timber made from beech laminated veneer lumber. The formulation of the adhesives is listed by DIBt.

The guidelines for using the particular adhesive must be followed by the manufacturer of the glued laminated timber made from beech laminated veneer lumber and must be available to the monitoring body for reference.

## 2.1.3 Design and requirements

### 2.1.3.1 General

Glued laminated timber made from beech laminated veneer lumber must comprise at least three laminations glued together on their flat surface.

The height  $h$  of the glued laminated timber made from beech laminated veneer lumber must not exceed 600 mm. The width  $b$  of the glued laminated timber must be at least 50 mm and not more than 300 mm. The maximum length of the glued laminated timber is 35 m.

## 2.2 Manufacture and marking

### 2.2.1 Manufacture

With regard to the requirements to be met in the manufacture of glued laminated timber made from beech laminated veneer lumber, DIN 1052:2008-12<sup>9</sup>, Annex H.2 applies analogously.

In addition, the following requirements must be observed.

The temperature in the manufacturing premises must be at least 20°C.

The specifications listed by the DIBt for the gluing of the laminations of beech laminated veneer lumber must be complied with.

Mechanical stresses during the minimum pressing time are not permitted. This does not apply to minor stresses which occur when the glued wood components are transported.

The manufacturers must have a certificate of qualification to glue load-bearing wood components in accordance with DIN 1052:2008-12, Section 14 and Annex A or DIN 1052-10:2012-05<sup>10</sup>, Section 5.

9 DIN 1052:2008-12 Design of timber structures; Common rules and rules for buildings  
10 DIN 1052-10:2012-05 Design of timber structures - Part 10: Additional provisions

### 2.2.2 Identification

Glued laminated timber made from laminated veneer lumber and the accompanying delivery note must be marked by the manufacturer with the mark of conformity (Ü mark) in accordance with the regional conformity regulations. The mark may only be applied if the requirements of Section 2.3 are fulfilled.

In addition, the glued laminated timber made from beech laminated veneer lumber and/or the delivery notes must carry the following:

- designation of the subject of the approval,
- date of manufacture,
- symbol of the manufacturing plant
- marking that enables tracing back to the manufacture.

### 2.3 Assessment of conformity

#### 2.3.1 General

Conformity with the provisions of this National Technical Approval must be confirmed for each manufacturing plant, in accordance with the following provisions, by means of a conformity certificate on the basis of factory production control and regular independent monitoring, including a first inspection.

The manufacturer of the construction product must engage a recognised certification body and a recognised monitoring body for the purpose of issuing the conformity certificate and for the independent monitoring, including the required product tests.

The manufacturer must declare that a conformity certificate has been issued by marking the construction products with the mark of conformity (Ü mark), also indicating the intended purpose of the product.

The certification body shall, for information purposes, provide the Deutsches Institut für Bautechnik with a copy of the conformity certificate it has issued.

#### 2.3.2 Factory production control

In each manufacturing plant, factory production control must be set up and implemented. Factory production control means continuous monitoring conducted by the manufacturer to ensure that the construction products it manufactures comply with the provisions of this National Technical Approval.

With regard to the factory production control of glued laminated timber made from beech laminated veneer lumber, DIN 1052:2008-12, Annex H.3 applies analogously.

The factory production control shall include at least the measures detailed below:

- Checking the sorting of the raw material,
- Inspection and testing conducted during the manufacturing process:
  - Maintaining a gluing log, in which at least the following information is recorded on each gluing day:
    - Adhesive: make, date of manufacture and delivery, use-by date, mix ratio of adhesive and hardener, wood moisture content of the laminations prior to gluing

Ambient conditions during gluing and setting

Quantity applied

Method of application

Open and closed waiting time of the adhesive

Pressing force

Duration of pressing,

- Testing the density of the laminations; the requirement is deemed fulfilled if no more than 5 out of 100 consecutive density measurements are below the value specified in Section 2.1.1.1.

- Testing the flatwise bending strength of the laminations made of laminated veneer lumber in accordance with DIN EN 408<sup>11</sup>:

At least two random samples are taken per work shift. The density of the two samples is determined before testing. The requirement specified in Section 2.1.1.1 must be fulfilled. A bending specimen with the dimensions specified in DIN EN 408 is cut from each sample and used to measure the flatwise bending strength as per DIN EN 408. At least every other bending specimen must have a finger joint in an edge veneer, centrally in relation to the length of the specimen. The laminations made of laminated veneer lumber must fulfil the requirements for characteristic bending strength, as stated in Table 1 of this National Technical Approval. The requirement is deemed fulfilled if no more than 5 out of 100 consecutively tested samples have bending strengths below the characteristic bending strength stated in Table 1.

- Testing the glued joint strength of the glued laminated timber made from beech laminated veneer lumber in accordance with DIN EN 14374:2005-02, Section 4.2 on at least two test specimens per 20 m<sup>3</sup> of glued laminated timber manufactured, but at least one test per work shift. The requirements of the standard DIN EN 14374:2005-02, Section 4.2 must be fulfilled.

The results of the factory production control must be recorded and evaluated. The records must contain at least the following information:

- Designation of the construction product and/or the raw material and the constituents,
- Type of inspection or testing,
- Date of manufacture and testing of the construction product and/or raw material or the constituents,
- Result of the inspections and testing and, if applicable, comparison with the requirements,
- Signature of the person responsible for the factory production control.

The records must be filed for at least five years and must be submitted to the monitoring body engaged to conduct the independent monitoring. The records shall be presented to the Deutsches Institut für Bautechnik and the responsible Chief Construction Supervision Authority on request.

If the test results are inadequate, the manufacturer shall take the necessary measures to rectify the defect without delay. Construction products that do not conform to the requirements must be handled in such a way that they cannot be confused with conforming products. After the defect has been rectified, the relevant test shall be repeated without delay – in so far as this is technically possible and necessary in order to verify rectification of the defect.

### 2.3.3 Independent monitoring

At each manufacturing plant, the factory production control must be checked by an independent monitoring body at regular intervals, but at least twice a year. Independent monitoring shall entail a first inspection, and samples can also be taken for testing. The sampling and testing are the responsibility of the recognised monitoring body.

11 DIN EN 408:2010-12 Timber structures - Structural timber and glued laminated timber – Determination of some physical and mechanical properties

For the independent monitoring of glue laminated timber made from beech laminated veneer lumber, DIN 1052: 2008-12, Annex H.4 applies analogously. As a minimum, the tests specified in Section 2.3.2 for the factory production control must be conducted.

In the first inspection of the glued laminated timber made from beech laminated veneer lumber, the following test must be carried out, as a minimum:

- Determination of the characteristic bending strength and mean local flexural modulus of elasticity as per DIN EN 408 on 10 glued laminated timber test specimens with the largest component height being 600 mm. The glued laminated timber test specimens must achieve at least the characteristic bending strength and the mean elastic modulus stated in Table 2 of this National Technical Approval.
- Determination of the characteristic shear strength as per DIN EN 408 on 10 glued laminated timber test specimens with the largest component height being 600 mm. The glued laminated timber test specimens must achieve at least the characteristic shear strength stated in Table 2 of this National Technical Approval.
- Determination of the characteristic tensile strength parallel to the grain as per DIN EN 408 on 30 laminated veneer lumber laminations, 150 mm wide. The laminations made of laminated veneer lumber must fulfil the requirements for the characteristic tensile strength, as stated in Table 1 of this National Technical Approval.
- Determination of the characteristic flatwise bending strengths as per DIN EN 408 on 30 laminations, 150 mm wide. The laminations made of laminated veneer lumber must fulfil the requirements for the characteristic bending strength, as stated in Table 1 of this National Technical Approval.
- Testing of the glued joint strength of the glued laminated timber made from beech laminated veneer lumber as per DIN EN 14374:2005-02, Section 4.2 on 10 glued laminated timber test specimens. The requirements of the standard DIN EN 14374:2005-02, Section 4.2 must be fulfilled.
- Determination of density and moisture on all the glued laminated timber test specimens and laminations. The requirement as specified in Section 2.1.1 of this National Technical Approval must be fulfilled.

In addition, the regular independent monitoring must include the tests detailed below:

- Determination of the characteristic flatwise bending strengths as per DIN EN 408 on 20 laminations. The laminations made of laminated veneer lumber must fulfil the requirements for the characteristic bending strength, as stated in Table 1 of this National Technical Approval.
- Testing of the glued joint strength of the glued laminated timber made from beech laminated veneer lumber as per DIN EN 14374:2005-02, Section 4.2 on 5 glued laminated timber test specimens. The requirements of the standard DIN EN 14374:2005-02, Section 4.2 must be fulfilled.
- Determination of density and moisture on all the test specimens and laminations. The requirement as specified in Section 2.1.1 of this National Technical Approval must be fulfilled.

The results of the certification and independent monitoring must be filed for at least five years. They shall be presented by the certification body or monitoring body to the Deutsches Institut für Bautechnik and the responsible Chief Construction Supervision Authority on request. The results of the first inspection of the glued laminated timber shall be presented to the Deutsches Institut für Bautechnik.

### 3 Provisions for design and calculation

#### 3.1 General

- 3.1.1 Structural analysis for the stability of wood components using glued laminated timber made from beech laminated veneer lumber must be carried out in each individual case.
- 3.1.2 Unless specified otherwise in this National Technical Approval, wood components made of glued laminated timber made from beech laminated veneer lumber must be designed in compliance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA.
- 3.1.3 For calculation of the relative slenderness ratio corresponding to  $\lambda_{rel,m}$ , of the critical overturning moment  $M_{y,crit}^0$  or the critical bending stress  $\sigma_{m,crit}$  as per DIN EN 1995-1-1:2010-12, Section 6.3.3 in conjunction with DIN EN 1995-1-1/NA, NCI to 6.3.3 and NCI NA.13.3, the product of the 5 % quantile of the stiffness values may be multiplied by the factor 1.2.
- 3.1.4 For the design of wood connections, the provisions of the standard DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA apply as for hardwood, and the provisions of the National Technical Approval No Z-9.1-838 correspondingly.

#### 3.2 Design and calculation as per DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA

- 3.2.1 For glued laminated timber made from beech laminated veneer lumber, the characteristic strength, stiffness and density values as stated in Table 2, apply. The definition of the characteristic strength, stiffness and density values corresponds to DIN EN 1995-1-1.

The compression stresses perpendicular to the grain must be verified with a lateral pressure factor of  $k_{c,90} = 1.0$  for all support conditions.

The crack factor  $k_{cr}$  can be applied as 1.0.



Table 2: Characteristic strength, stiffness and density values for glued laminated timber made from beech laminated veneer lumber

Strength class		GL 70
<b>Strength values (N/mm<sup>2</sup>)</b>		
$f_{m,y,k}$	Characteristic bending strength for flatwise bending stress acting on the laminations of glued laminated timber	70 <sup>a</sup>
$f_{m,z,k}$	Characteristic bending strength for edgewise bending stress acting on the laminations of glued laminated timber	70
$f_{t,0,k}$	Characteristic tensile strength along the grain	55 <sup>b</sup>
$f_{t,90,k}$	Characteristic tensile strength perpendicular to the grain	1.2
$f_{c,0,k}$	Characteristic compressive strength parallel to the grain	49.5 <sup>c, d</sup>
$f_{c,90,k}$	Characteristic compressive strength perpendicular to the grain	8.3 <sup>c</sup>
$f_{v,k}$	Characteristic shear strength	4.0 <sup>e</sup>
<b>Stiffness values (N/mm<sup>2</sup>)</b>		
$E_{0, \text{mean}}$	Mean value of modulus of elasticity along the grain	16,700
$E_{0,05}$	5 % quantile value of modulus of elasticity along the grain	15.300
$E_{90, \text{mean}}$	Mean value of modulus of elasticity perpendicular to the grain	470
$E_{90,05}$	5 % quantile value of modulus of elasticity perpendicular to the grain	400
$G_{\text{mean}}$	Mean value of shear module	850
$G_{05}$	5 % quantile value of shear modulus	760
<b>Density value (kg/m<sup>3</sup>)</b>		
$\rho_k$	Characteristic density	680
a	<p>For the flatwise bending strength of the laminations of the glued laminated timber, the characteristic strength may be multiplied by the factor</p> $k_{h,m} = \left(\frac{600}{h}\right)^{0.14}$ <p><math>h</math> = height of the glued laminated timber cross-section in mm</p>	
b	<p>The characteristic compressive strength may be multiplied by the factor</p> $k_{h,t} = \left(\frac{600}{h}\right)^{0.10}$ <p><math>h</math> = larger side length of the glued laminated timber perpendicular to the longitudinal axis in mm</p>	
c	<p>If the glued laminated timber is used exclusively in the ambient conditions of service class 1, the characteristic compressive strength may be increased by the factor 1.2.</p>	
d	<p>If there are more than three laminations of laminated veneer lumber, the characteristic compressive strength parallel to the grain may be increased by the factor <math>k_{c,o} = \min(0.0009 h + 0.892 ; 1.18)</math>.</p> <p><math>h</math> = height of the glued laminated timber cross-section in mm</p>	
e	<p>The characteristic shear strength may be multiplied by the factor</p> $k_{h,v} = \left(\frac{600}{h}\right)^{0.25}$ <p><math>h</math> = height of the glued laminated timber cross-section in mm</p>	

### 3.3 Fire and moisture resistance; sound and thermal insulation

The required verifications of fire and moisture resistance and thermal and sound insulation are stipulated in the regulations, standards and guidelines issued for this purpose.

Glued laminated timber made from beech laminated veneer lumber is classified as exhibiting normal flammability.

The design values of burning rates for glued laminated timber made of beech laminated veneer lumber are given in the standard DIN EN 1995-1-2<sup>12</sup>. The design values of burning rates for laminated veneer lumber must be applied.

The values for shrinkage and swelling behaviour are given in the standard DIN EN 1995-1-1/NA. The shrinkage and swelling values for laminated veneer lumber without crosswise layers must be applied.

## 4 Provisions for construction

4.1 Openings in glued laminated timber made of laminated veneer lumber are not permitted.

4.2 Fasteners

When using fasteners, the provisions of the standard DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA and the national technical approvals or European technical approvals for the respective fasteners must be observed.

In addition, the provisions of the National Technical Approval No. Z-9.1-838 apply. When designing the fasteners, a characteristic density of the glued laminated timber made from beech laminated veneer lumber of 680 kg/m<sup>3</sup> must be applied.

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