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National Technical approval

Deutsches Institut für Bautechnik

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Applicant:

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Object for approval:

Duobalken and Triobalken (Double and triple beams)

(Glued solid timber from two or three glued together boards, planks or scantlings)

The above named object for approval is herewith generally technically approved.
This national technical approval consists of seven pages and two attachments.
This national technical approval replaces general technical approval Nr. Z-9.1-440 from 16th January 2006. The object was generally technically approved for the first time on the 26th January 1999.

I. GENERAL PROVISIONS

1 With the national technical approval the applicability and/or practicability of the approval object, as defined by the state building regulations, is established.

2 The national technical approval does not replace the statutory authorization, compliance and certification required for the carrying out of building projects.

3 The national technical approval is issued without prejudice to the rights of a third person, especially private property rights.

4 The manufacturer and distributor of the approval object have, without prejudice to any further provisions in the "Special provisions", to make available to the user and/or handler of the approval object copies of the national technical approval and to point out that the national technical approval must be made available at the application location. Copies of the national technical approval are to be made available to the participating authorities on request.

5 The national technical approval must only be copied in its entirety. Publication of extracts requires the consent of the Deutsches Institut für Bautechnik. Advertising brochure texts and diagrams must not contradict the general technical approval. Translations of the general technical approval must contain the notification "Translation of the original German version has not been authorized by the German institute for building technology".

6 The national technical approval is revocable. The provisions of the general technical approval can be supplemented and modified retroactively especially if new technical innovations require this.

II. SPECIAL PROVISIONS

1 Approval object and Scope

1.1 Approval object

Glued solid timber beams according to this national technical approval consists of two (Duobalken) or three (Triobalken) bonded together solid timber (coniferous) boards, planks or scantlings, referred to below as laminations, with a maximum cross sectional area of the single lamination of 280 x 80 mm or 100 x 120 mm (see attachment 1).

1.2 Scope

1.2.1 Duobalken and Triobalken, according to this national technical approval, may be used for all timber structures, for which the application of solid timber or glued laminated timber is allowed for in the standard DIN 1052[1].

1.2.2 Utilization is only permissible in the service classes 1 and 2 according to DIN 1052:2008[2]. Extreme climatic cycling is to be excluded.

With utilization the standards of the series DIN 68800[3] are to be observed.

2 Provisions for the Duobalken and Triobalken

2.1 Properties

2.1.1 The Duobalken shall consist of two, the Triobalken of three, glued together laminations (see attachments 1 and 2).

The laminations to be bonded (boards, planks or scantlings) shall be of solid timber (coniferous) and satisfy at least the strength grade C 10 or C 24M according to DIN 4074-1[4].

2.1.2 **The cross sectional sizes of the laminations shall not exceed for:**

- beams according to attachment 1 b (width) x d (thickness) = 280 x 80 mm,
- beams according to attachment 2 b (width) x d (thickness) = 100 x 120 mm.

Individual timber with a thickness t ≥ 100 mm must be core separated.

The laminations may be jointed parallel to grain by finger jointing according to DIN 1052[2], attachment I.

2.1.3 The wood surfaces to be bonded shall be planed.

With the gluing the moisture content of each individual timber shall not exceed u = 15 %, whereby with laminations with a thickness of > 80 mm the moisture gradient in the wood shall not exceed 2 %. The moisture difference of individual timbers to be bonded shall not exceed 4 %. When gluing the timbers together flatwise, the individual timbers are to be arranged so that the "right" sides (pith sides) are facing outwards.

1 The following technical building regulations apply

DIN 1052-1 to -3:1988-04	Timber structures, with the respective corresponding Amendment A1:1996-10
DIN 1052:2008-12	Design of timber structures – General design rules and rules for buildings

2 DIN 1052:2008-12 Design of timber structures – General design rules and rules for buildings

3

DIN 68800-1:1974-05	Protection of timber used in buildings – General specifications
DIN 68800-2:1996-05	Protection of timber – Part 2: Preventive constructional measures in buildings
DIN 68800-3:1990-04	Protection of timber; preventive chemical protection

* DIN 4074-1:2003-06 Strength grading of wood - Part 1: Coniferous sawn timber

The bonding pressure with gluing shall be 0.6 N/mm^2 to 0.8 N/mm^2.

2.1.4 For gluing of the boards, planks or scantlings into beams and for manufacturing of the laminations finger joints an adhesive according to DIN EN 301[5] shall be used that fulfills the requirements of the adhesive type I according to DIN EN 301 based on tests according to DIN EN 302-1 to -4[6] and with respect to the usage requirements according to DIN 68141[7]. Alternatively, an adhesive on the basis of a general technical approval for this application purpose may be used.

2.1.5 With the gluing of a timber beam, individual timbers of different strength grades may be used. For the classification of the finished beams the strength grade of the individual timber assigned to the lowest strength class is applicable in each case.

2.1.6 With beams from a profile height of 300 mm, an increased finger joint strength according to DIN 1052[2] for finger jointed individual timber is to be established.

2.1.7 The Duobalken and Triobalken shall fulfill the requirements of DIN EN 336[8], paragraph 4.3, tolerance class 2.

2.2 Manufacturing and labelling

2.2.1 Manufacture

The manufacturing plant shall be in possession of a certification regarding the suitability for the gluing of load-bearing wood components according to DIN 1052-1[9], paragraph 12 and attachment A, or according to DIN 1052:2008[2], paragraph 14 and attachment A.

2.2.2 Labelling

The beams and the delivery notes for the beams shall be labelled by the manufacturer with the compliance mark (Ü-Zeichen) according to the compliance mark directive of the federal states. The labelling must only take place if the requirements according to paragraph 2.3 are met.

Furthermore the beams and/or the delivery notes are to be marked with the following information:

- Description of the approval object (Duobalken/Triobalken)
- Strength class (of the lamination with the lowest strength)

A durable coded marking on the beams is permissible if the compliance mark is present on the delivery note and the labelling parameters are deposited at the external control location.

5	DIN EN 301:2006-09	Adhesives, phenolic and aminoplastic, for load-bearing timber structures - Classification and performance requirements
6	DIN EN 302-1 to -4	Adhesives for load-bearing timber structures - Test methods Part 1: Determination of longitudinal tensile shear strength; Date of issue 2004-10 Part 2: Determination of resistance to delamination; Date of issue 2004-10 Part 3: Determination of the effect of acid damage to wood fibres by temperature and humidity cycling on the transverse tensile strength; Date of issue 2006-02 Part 4: Determination of the effects of wood shrinkage on the shear strength; Date of issue 2004-10
7	DIN 68141:2008-01	Wood adhesives; Determination of properties of use of wood adhesives for load-bearing timber structures
8	DIN EN 336:2003-09	Structural timber – Sizes, permitted deviations - Dimensions, permissible deviations
9	DIN 1052-1:1988-04	Timber constructions, with the respective corresponding modification sheet A1:1996-10 is to be observed.

2.3 Compliance certificate

2.3.1 General

The conformation of the compliance with the provisions of this national technical approval shall, for every manufacturing plant of Duobalken and Triobalken, result from a compliance certificate on the basis of the factory production control and regular external control including initial testing according to the requirements of the following provisions.

For the issuance of the compliance certificate and the external control including the product testing to be carried out in the process, the manufacturer of the building product has to engage, for this purpose, a approved certification body as well as a approved inspection body.

A copy of the compliance certificate issued by the inspection body is to be submitted to the Deutsches Institut für Bautechnik for their attention.

2.3.2 Factory production control

In every production plant a factory production control is to be established and carried out. A factory production control is to be understood as the continuous control carried out by the manufacturer, with which it is assured that the building products manufactured correspond to the provisions of this national technical approval.

The factory production control shall include at least the provisions carried out in the following:

- Inspection and grading of the components
- Control and inspections which are to be carried out during the manufacturing:

  Maintain a glue book in which, on every glue day, at least the following records are to be made:

  - Adhesive: Product brand, manufacturing and supply dates, expiration date;
  - Moisture content of the laminates before gluing (by laminates with d (thickness) > 80 mm also the moisture gradient in the wood);
  - Atmospheric environment at the time of the gluing and curing

  Finger jointed laminates are to be inspected according to DIN 1052:2004[2], attachment I.
- Verification and testing that is to be carried out on the finished building product

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

- Description of the building product or the components
- Type of control or inspection
- Date of manufacture and inspection of the building product
- Results of control and inspection
- Signature of the person responsible for the factory production control

The records are to be kept for at least five years and presented to the control body engaged for the external control. They are to be presented to the German institute for building technology and the appropriate chief building control authorities on demand.

With insufficient test results the manufacturer is to immediately undertake the required measures for the remedy of the insufficiency. Building products that do not correspond to the requirements are to be handled in a manner that excludes a possible mix-up with those that do correspond.

After the insufficiency has been remedied, insofar as it is technically possible and is required as proof of insufficiency removal, the inspection in question is to be repeated immediately.

2.3.3 External control

In every manufacturing plant the factory production control is to be regularly checked by an external control, however at least twice a year. Within the parameters of the external control an initial inspection is to be carried out and samples for sample inspections can also be taken.

The following aspects are to be at least considered in the external control:

- The inspections, within the parameters of the external control, are to be carried out according to DIN 68140-1[10], paragraph 7.
- Carrying out of inspections according to paragraph 2.3.2
- Inspection of the grading of the components
- The quality of the glue joints is to be tested on the basis of DIN EN 386[11] by shear tests according to DIN EN 392[12]
- The sampling and testing is the responsibility of the respective recognized inspection body (with finger joints the recognized inspection authority for the inspection of glued laminated timber according to Building Rules List[13] A part 1, lfd. Nr. 3.1.3).

The results of the certification and external control are to be stored for at least five years. They are to be presented by the certification body and/or inspection body to the Deutsches Institut für Bautechnik and the responsible supreme building control authorities on demand.

3 Provisions for design

3.1 General

3.1.1 Design of building components from Duobalken and Triobalken shall be carried out according to DIN 1052[1], insofar as nothing else is defined in this national technical approval.

The design may take place taking into consideration the following corresponding provisions and also according to DIN V ENV 1995-1-1[14] in conjunction with the national application document (NAD)[15].

3.1.2 This national technical approval does not replace the structural analysis for the structural integrity of building components using the beams regulated here.

3.2 Design

3.2.1 For the design of the Duobalken and Triobalken according to DIN 1052-1[16] and DIN 1052-2[17], in load case H, the permissible stress and mean value of the elasticity and shear modulus in DIN 1052-1, tables 5 and 1 apply. The strength grade of the individual timber having the lowest strength grade is the decisive factor.

3.2.2 With the design according to DIN 1052[2] the characteristic strength, rigidity and density values from table F5 according to this standard apply. In this case, the lamination with the lowest strength classification in the cross section is of significance.

For Duobalken and Triobalken of the strength classification C24, deviating from DIN 1052:2008[2], Table F.5, the modulus of elasticity parallel to the grain may be taken as $E_{0,mean}$ = 11600 N/mm².

10 DIN 68140-1:1998-02 Wood finger-jointing - Part 1: Finger jointing of softwood for load-bearing structures
11 DIN EN 386:2002-04 Glued laminated timber - Performance requirements and minimum production requirements
12 DIN EN 392: 1996-04 Glued laminated timber – Shear test of glue lines
13 Building Products List A, Building Products List B as well as List C, date of issue 2008/1, released in the Deutsches Institut für Bautechnik communication, special edition No. 36 from the 17th June 2008
14 DIN V ENV 1995-1-1:1994-06 Eurocode 5 - design of timber structures; General design rules and rules for buildings
15 National application document (NAD): "Directive for the Application of DIN V ENV 1995-1-1", date of issue February 1995
16 DIN 1052-1:1988-04 Timber constructions; attention should be paid to Amendment A1:1996-10
17 DIN 1052-2:1988-04 Timber constructions; Mechanical joints; attention should be paid to Amendment A1:1996-10

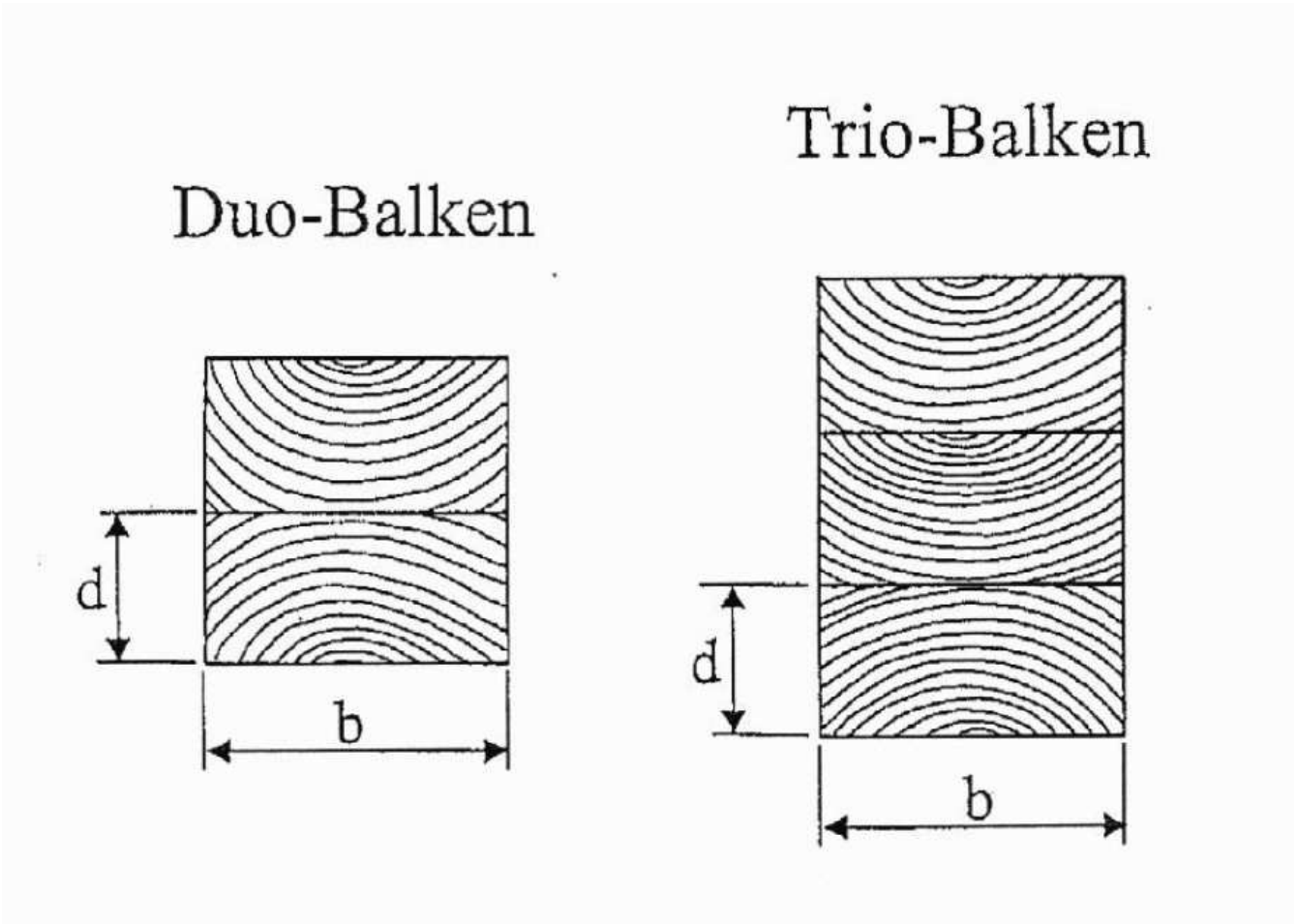
3.3 Protection against fire, moisture, noise and thermal insulation

For the required verification of protection against fire, moisture, noise and thermal insulation the regulations, standards and directives issued for this purpose apply.

4 Provisions for implementation

With the use of fasteners the provisions of DIN 1052[1] or the national technical approval of the respective fastener are to be observed.

Henning Notarized

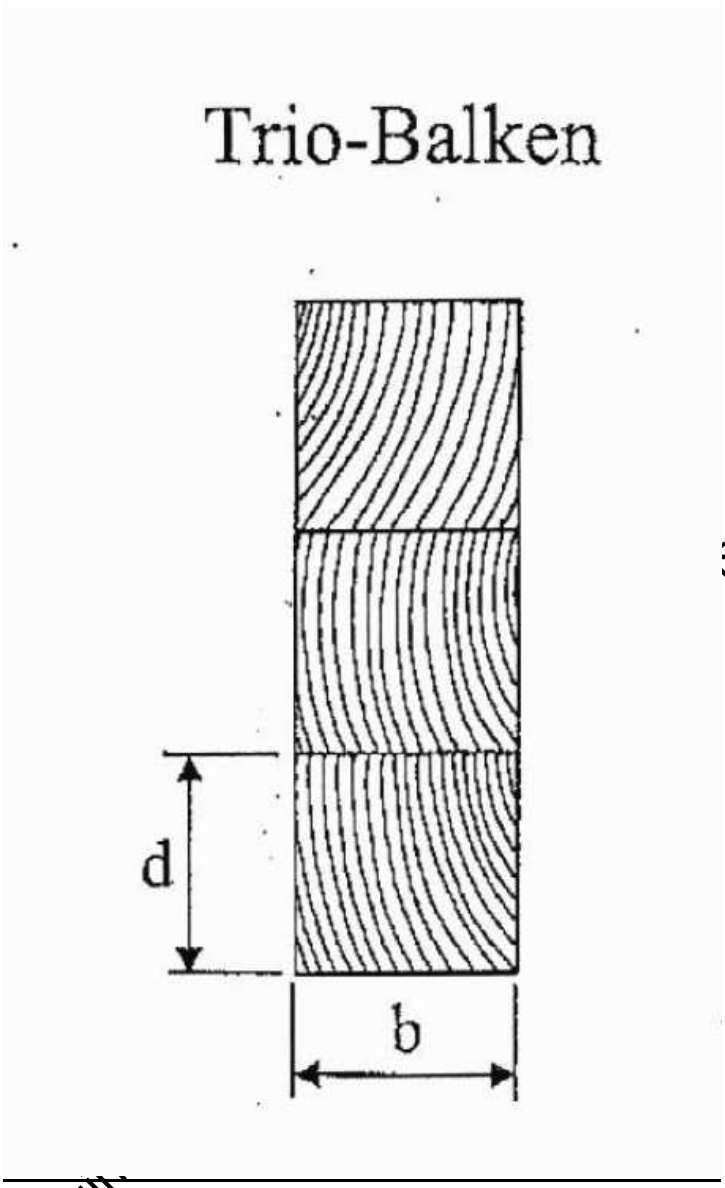


Cross sectional sizes of laminations of the individual timber:

Thickness	d	≤	8 cm
Width	b	≤	28 cm

Studiengemeinschaft Holzleimbau e.V. Überwachungsgemeinschaft Konstruktionsvollholz e.V	**Duobalken** **Triobalken** **Layup**	**Attachment 1** To the national technical approval N0. Z-9.1-440 from the 30th January 2009

Trio-Balken



Cross sectional sizes of laminations of the individual timber:

Thickness	d	≤	10 cm
Width	b	≤	12 cm

Studiengemeinschaft Holzleimbau e.V. Überwachungsgemeinschaft Konstruktionsvollholz e.V	**Triobalken** **Layup**	**Attachment 2** To the national technical approval N0. Z-9.1-440 from the 30th January 2009