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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-13/0785

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*		THOMA Holz 100
Zulassungsinhaber *Holder of approval*		Firma Ing. Erwin Thoma Holz GmbH Hasling 35 5622 Goldegg im Pongau ÖSTERREICH
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*		Plattenförmiges Vollholzbauteil - Bauteil aus mit Dübeln verbundenen Holzplatten zur Verwendung als tragendes Bauteil in Gebäuden *Solid wood slab element - element of dowel jointed timber boards to be used as a structural element in buildings*
Geltungsdauer: *Validity:*	vom *from* bis *to*	21 June 2013 21 June 2018
Herstellwerke *Manufacturing plants*		Holz100 Werk Österreich Nr. 195 8862 STADL an der Mur ÖSTERREICH Holz100 Werk Schwarzwald Flugplatz N1 77933 Lahr

Diese Zulassung umfasst *This Approval contains*	11 Seiten einschließlich 2 Anhänge *11 pages including 2 annexes*

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I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the product and intended use

1.1 Definition of the construction product

THOMA Holz100-Elemente are solid wood slab elements up to 400 mm thick, made from parallel, crosswise (rectangular) or under an angle of 45° arranged layers of boards or squared timbers (examples see Annex). The single layers are connected by wooden dowels made from beech wood.

THOMA Holz100-Elemente are produced as wall, floor, roof elements with a width up to 3,00 m and a length up to 10,00 m.

THOMA Holz100-Elemente are considered as cross laminated timber elements, where the layers are connected mechanically. The outer layers of floor and roof elements are always arranged in longitudinal direction of the elements. For roof and floor elements the longitudinal direction is the span direction, for wall elements outer layers may also be arranged in horizontal direction.

Between the load-carrying layers in longitudinal direction intermediate layers are arranged under an angle of 45° or 90° to the outer layers.

Wall elements consist of at least one longitudinal, one cross and one diagonal layer.

The single board layers are between are at least 24 mm thick, the squared timbers are at least 40 mm thick. The boards have a width of at least 100 mm.

Wood species is European spruce or equivalent softwood (fir, pine, larch, douglas fir).

The application of wood preservatives or flame retardants is not covered by this European technical approval.

1.2 Intended use

THOMA Holz100-Elemente are intended to be used as structural or non structural wall, roof or floor elements in buildings and timber structures. THOMA Holz100-Elemente may be subjected to actions perpendicular as well as in the plane of the slab.

THOMA Holz100-Elemente shall be subjected to static and quasi static actions only.

THOMA Holz100-Elemente are intended to be used in service classes 1 and 2 according to EN 1995-1-1[7]. Members which are directly exposed to the weather shall be provided with an effective protection for the solid wood slab element in service.

The provisions made in this European technical approval are based on an assumed working life of the solid wood slab of 50 years, provided that the conditions laid down in section(s) 4.2, 5.1 and 5.2 are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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[7] EN 1995-1-1:2004 + AC:2006 + A1: 2008 Design of timber structures – Part 1-1: General –Common rules and rules for buildings

2 Characteristics of the product and methods of verification

The evaluation of the fitness for use of the THOMA Holz100-Elemente for the intended use was performed according to the regulations aggreed upon within EOTA.

Details on the elements are deposited at Deutsches Institut für Bautechnik (DIBt).

Note: In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.1 Mechanical resistance and stability (ER1)

2.1.1 General

Design and execution of wall, floor, roof or special elements of the THOMA Holz100-Elemente is performed according to EN 1995-1-1[7]. The actions shall be applied according to EN 1991-1-1[8]. Additional national provisions shall be taken into account.

The static verification of the building components of the THOMA Holz100-Elemente is to be made for each application according to the relevant national provisions.

It is assumed, that shear deformation between the layers are considered for actions perpendicular to the plane of the element, e.g. according to EN 1995-1-1[7], sections 9.1.3 and 9.1.4.

For the design of the single boards the characteristic nominal values for the strength and stiffness for softwood of the strength class C24 according to EN 338[9] shall be applied.

For the factor k_{mod} the value for solid timber applies. The factor k_{def} can be assumed to be 2,0 x k_{def} for solid timber.

2.1.2 Specification of the elements

The boards of the single layers are made from European spruce or equivalent softwood. At least 70 % of the load-carrying boards of one layer have to correspond at least to strength class C24. The remaining 30 % of the boards shall at least correspond to strength class C16. The dowels for the jointing of the layers go through all layers.

The single boards of the layers have a thickness of at least 24 mm, the squared timbers of at least 40 mm and a width of at least 100 mm. Butt jointing of the single boards is not allowed. Between the loadcarrying layers in longitudinal direction intermediate layers are arranged under an angle of 45° or 90°. The outer layers of floor and roof elements are always arranged in longitudinal direction where the longitudinal direction is the span direction. For wall elements the outer layers may be arranged in horizontal and one in vertical direction.

Between two single boards a gap up to 10 mm is allowed. Elements may be built-up asymmetrically (e.g. with only one diagonal layer or with different layer thicknesses).

Tolerances are given in the following table:

Thickness (depth)	h	± 2 mm
Length	l	± 3 mm
Width	b	± 3 mm
Camber		1:500

[8] EN 1991-1-1:2002 + AC:2009 Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings

[9] EN 338:2009 Structural timber – Strength classes

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2.1.3 Specification of the hardwood dowel fasteners as part of the element

The single layers are connected by wooden dowel fasteners with a diameter of 20 mm. The dowels are dryed before positioning. The density of the beech dowels is at least ρ_k = 630 kg/m³, The amount of skew fibres is within a maximum of 7 %.

The beech wood screws are arranged at all four edges of the elements in each intersection of the boards arranged in longitudinal and crosswise direction. In the intermediate area they are staggered and arranged evenly distributed over the element.

2.1.4 Dimensional stability

It is recommended, that the product is used in conditions where the equilibrium moisture content of the elements does not increase by more than 10 %.

2.2 Safety in case of fire (ER 2)

2.2.1 Reaction to fire

In accordance with Commission Decision 2003/43/EC[10], as amended, the THOMA Holz100-Elemente covered by this European technical approval for use as wall, roof, ceiling and special construction components comply with Euroclass D-s2,d0 according to EN 13501-1[11]. For the use as floor construction components they comply with Euroclass D_{FL}-s1. The boundary conditions stated in the commission decision have to be attended for this classification.

2.2.2 Resistance to fire

For the timber members the charring rates given in EN 1995-1-2[12] for solid wood may be assumed. National regulations may apply.

2.3 Hygiene, health and the environment (ER 3)

2.3.1 Dangerous substances

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.3.2 Vapour permeability

No performance determined.

2.4 Safety in use (ER 4)

2.4.1 Impact resistance

No performance determined.

2.5 Protection against noise (ER 5)

2.5.1 Airborne sound insulation

No performance determined.

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[10] Official Journal of the European Communities L 13/35, 18. January 2003

[11] EN 13501 1:2007+A1:2009 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

[12] EN 1995-1-2:2004 +AC2009 Eurocode 5: Design of timber structures – Part 1-2: General – Structural fire design

2.5.2 Impact sound insulation

No performance determined.

2.5.3 Acoustic absorption

No performance determined.

2.6 Energy economy and heat retention (ER 6)

2.6.1 Thermal conductivity

Design values for the timber elements can be taken from EN ISO 10456[13]. Calculation can be performed according to EN ISO 6946[14] or applicable national standards.

The laws, regulations and provisions applicable for the site of use shall be observed.

2.6.2 Air-tightness

No performance determined.

2.7 Aspects of durability, serviceability, identification

2.7.1 Durability

The use of the product is admissible only in service classes 1 and 2 according to EN 1995-1-1[7]. When using the elements as external constructions components an additional durable effective weather protection shall be ensured.

The properties of the timber elements shall not adversely be affected by the action of moisture. Depending on the application, the timber elements shall be protected from moisture.

2.7.2 Serviceability

Manufacturing tolerances of the timber elements are permitted within specified limits.

The dimensions of the timber elements shall be stable and must not be adversely affected by any actions (e.g. moisture).

2.7.3 Identification

The THOMA Holz100-Elemente shall be marked such that they can be clearly identified.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the Commission Decision 97/176/EC[15], amended by Commission Decision 2001/596/EC[16] of 8 January 2001, the system 2+ of attestation of conformity applies to the construction product[17].

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

(a) Tasks for the manufacturer:

- (1) initial type-testing of the product;
- (2) factory production control;
- (3) testing of samples taken at the factory in accordance with a prescribed test plan.

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13 EN ISO 10456:2007 + AC:2009 Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values

14 EN ISO 6946:2007 Building components and building elements – Thermal resistance and thermal transmittance – Calculation method

15 Official Journal of the European Communities L 73 of 17.02.1997

16 Official Journal of the European Communities L 209/33 of 08.01.2001

17 No clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material).

(b) Tasks for the approved body:

(4) certification of factory production control on the basis of:

- initial inspection of factory and of factory production control;
- continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use raw materials with the relevant inspection documents as stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik.[18]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of solid wood slabs in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks for the approved bodies

The approved body shall perform the

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

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[18] The control plan is a confidential part of the European technical approval and only handed over to the approved body/bodies involved in the procedure of attestation of conformity. See section 3.2.2.

3.3 CE marking

The CE marking shall be affixed on the accompanying commercial document. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- the species of wood used,
- the number and orientation of layers,
- the type and identification of the element describing its intended use,
- the nominal thickness of the element.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Installation

As fasteners only nails, screws, staples, bolts, dowels and ring connectors may be used. The respective provisions for spacing, penetration depths etc. of the fasteners shall be considered.

5 Indications to the manufacturer

5.1 General

It is the responsibility of the ETA holder to ensure that all necessary information on design and installation is submitted to those responsible for design and execution of the works constructed with the solid wood slab elements.

5.2 Packaging, transport and storage

The THOMA Holz100-Elemente shall be protected during transport and storage against any damage and detrimental moisture effects. The manufacturer's instruction for packaging, transport and storage shall be observed.

5.3 Use, maintenance, repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life. In case of a severe damage of a NUR-Holz Solid Timber Element immediate actions regarding the mechanical resistance and stability of the works shall be initiated.

Andreas Kummerow
p. p. Head of Department

beglaubigt:
Warns

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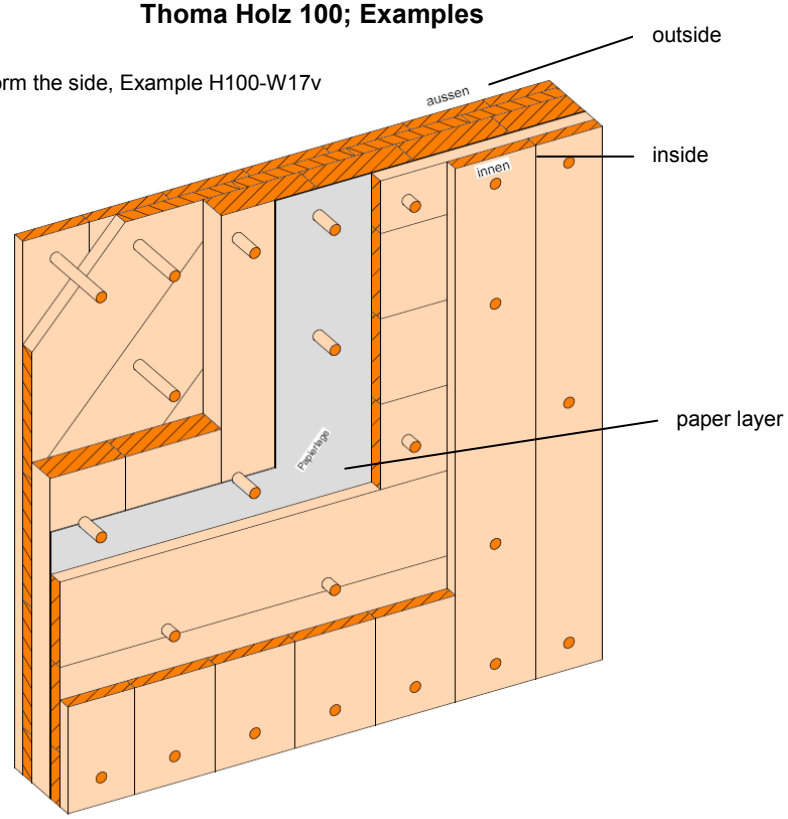
Thoma Holz 100; Examples

View form the side, Example H100-W17v



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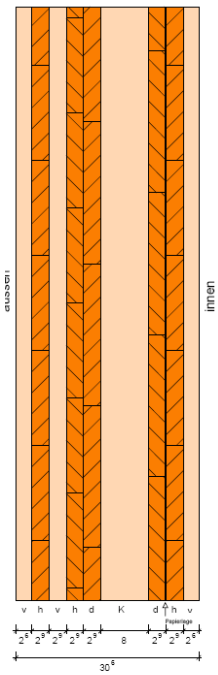

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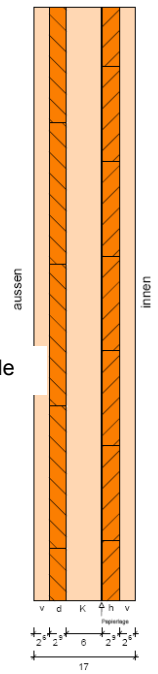

Legend:

d= diagonal layer of boards
v=vertical layer of boards
h=horizontal layer of boards
k=vertical core layer

THOMA Holz 100	Annex 1
Example of the assembly	

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Actions perpendicular to the plane

The verification of the stress distribution and the internal forces and moments in the THOMA Holz100-Elemente in case of actions perpendicular to the plane of the element is to be made in accordance with the theory for composite structures. In addition shear deformation between the layers shall be considered, e.g. according to EN 1995-1-1, sections 9.1.3 and 9.1.4.

Elements with two or three longitudinal layers may be calculated using the method of mechanically jointed beams given in Eurocode 5. For an element with more than three longitudinal layers other calculation methods such as the "shear analogy method" are also applicable.

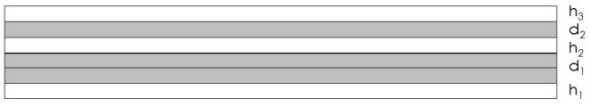
For the ultimate limit state design a slip modulus per dowel and shear plane between two adjacent board layers of K_u = 2000 N/mm shall be used. For roof and ceiling elements with outer layers with a thickness of at least 60 mm, the design a slip modulus per dowel and shear plane can be assumed to be K_u = 2700 N/mm.

The characteristic lateral load-carrying capacity of a wooden dowel, d = 20 mm can be assumed to be $R_{i,k}$ = 3800 N.

For the serviceability limit state design a slip modulus of K_{ser} = 3000 N/mm should be used. For roof and ceiling elements with outer layers with a thickness of at least 60 mm, the design a slip modulus per dowel and shear plane can be assumed to be K_{ser} = 4000 N/mm per dowel and shear plane.

THOMA Holz100-Elemente are only used as floor and roof elements where the span is parallel to the direction of the cover(outer)-layers. However, for concentrated forces a load distribution perpendicular to the cover layers may be assumed. An effective width of 70 % of the total width, but not more than 700 mm can be assumed hereby.

Example for the calculation: Arrangement with three longitudinal layers



$$I_{ef} = I_1 + I_2 + I_3 + \gamma_1 a_1^2 A_1 + \gamma_2 a_2^2 A_2 + \gamma_3 a_3^2 A_3$$

$$a_2 = \frac{\gamma_1 A_1 \cdot (\frac{h_1}{2} + d_1 + \frac{h_2}{2}) - \gamma_3 A_3 \cdot (\frac{h_2}{2} + d_2 + \frac{h_3}{2})}{\gamma_1 A_1 + \gamma_2 A_2 + \gamma_3 A_3}$$

$$a_1 = (\frac{h_1}{2} + d_2 + \frac{h_2}{2}) - a_2$$

$$a_3 = (\frac{h_2}{2} + d_2 + \frac{h_2}{2}) + a_2$$

$$\gamma_1 = \left(1 + \frac{\pi^2 E_1 A_1 \cdot s_1}{\ell^2 \; K_{ef,1}} \right)^{-1}$$

$$\gamma_2 = 1$$

$$\gamma_3 = \left(1 + \frac{\pi^2 E_3 A_3 \cdot s_3}{\ell^2 \; K_{ef,2}} \right)^{-1}$$

legend:

E_i =	Modul of Elasticity of the element part
A_i =	Area of the cross section
$K_{ef,i}$ /s_i =	effective stiffness of the joints within cross-sectional layer i
	Cross sectional layer d_2 of a board layer with two joints: $K_{ef,2}$ = K/2
	Cross sectional layer d_2 of a board layer with three joints: $K_{ef,1}$ = K/3
K =	slip module between two adjacent layers
s =	distance between the fasteners, assumed to be uplined in a row
h_i =	thickness of longitudinal layers
d_i =	overall thickness of cross-sectional layers
ℓ =	effektive span

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Actions in plane

For THOMA Holz100-Elemente loaded as shear walls an effective shear stiffness value of GA = 4,0 • 10^6 N per m wall length may be used for the serviceability state design.

If at least two longitudinal, two cross and two diagonal layers are present, an effective shear stiffness $(GA)_{ef}$ = 8,0 • 10^6 N per m of wall length may be assumed.

A maximum displacement of the height of the wall should not be exceeded in the serviceability state. This limit value will in general be governing.

In serviceability state design the horizuontal displacement of the wall should be limited. For a maximum displacement of, for example, 1/500 of the wall height, the horizontal load $F_{V,ser}$ per m wall is limited to:

$$F_{V,ser} \leq \frac{(GA)_{ef}}{500}$$

The characteristic load bearing capacity of a wall under horizontal load may be assumed with $F_{V,Rk}$ = 50 kN/m.

For elements with at least two longitudinal, two cross and two diagonal layers $F_{V,Rk}$ = 100 kN/m may be assumed.

If THOMA Holz100-Elemente are used as beams, the boards of the longitudinal layers shall be assumed as independent. The bending capacity hence is the sum of the bending capacities of the single boards of the longitudinal layers.

If THOMA Holz100-Elemente are used as columns, only the cross-sectional area of the boards of the longitudinal layers without cross- or diagonal layers shall be considered.

When calculating the effective bending stiffness, the slip between the longitudinal layers due to the deformation of the beech screw connection should be taken into account.

Initial deflections taking into account geometrical and structural imperfections may be assumed as for glulam members.

Buckling may be calculated according to EN 1995-1-1 taking into account the slip in the wooden screw connections. Furthermore an effective width for concentrated forces may be assumed.

Under concentrated forces the buckling load may be calculated with an effective width of up to b_{ef} = 5 b up to a maximum of H/2 (b = width of the contact area of a concentrated load; b and b_{ef} in longitudinal direction of the wall; H = Height of the element).

Mechanical fasteners

The characteristic load-bearing capacities of mechanical fasteners shall be determined according to EN 1995-1-1 resp. to the European technical approval for a fastener or relevant national rules. The gaps between the boards are to be considered as edges of the structural component.

For axially loaded self-tapping screws with a diameter of $d_1 \geq 8$ mm the gaps between the boards may, however, be disregarded.

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