

## European Technical Approval ETA-11/0338

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung  
*Trade name*

NUR-HOLZ Vollholzelemente  
Mit "Vollholzschrauben" aus Buche verbundene Elemente  
*NUR-HOLZ Vollholzelemente*  
*Elements jointed with "wooden screws" made of beech*

Zulassungsinhaber  
*Holder of approval*

Rombach Bauholz+Abbund GmbH  
Holdersbach 7  
77784 Oberharmersbach  
DEUTSCHLAND

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*

17 October 2011  
17 October 2016

Herstellwerk  
*Manufacturing plant*

Rombach Bauholz+Abbund GmbH  
Obertal 22  
77784 Oberharmersbach  
DEUTSCHLAND

Diese Zulassung umfasst  
*This Approval contains*

16 Seiten einschließlich 7 Anhänge  
*16 pages including 7 annexes*

## 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<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - 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<sup>4</sup>, as amended by law of 31 October 2006<sup>5</sup>;
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>.
- 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.

<sup>1</sup> Official Journal of the European Communities L 40, 11 February 1989, p. 12  
<sup>2</sup> Official Journal of the European Communities L 220, 30 August 1993, p. 1  
<sup>3</sup> Official Journal of the European Union L 284, 31 October 2003, p. 25  
<sup>4</sup> *Bundesgesetzblatt Teil I 1998*, p. 812  
<sup>5</sup> *Bundesgesetzblatt Teil I 2006*, p. 2407, 2416  
<sup>6</sup> 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

NUR-Holz Solid Timber Elements are solid wood slab elements made from several layers of boards. The single layers are connected by wooden screw fasteners made from beech wood (examples see Annex 1). The screws have an inner thread diameter of 20 mm and an outer diameter of 22 mm. They are driven into a predrilled hole of 20 mm where a thread is formed using a special device.

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

NUR-Holz Solid Timber Elements 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 one outer layer 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. For these elements the maximum distance between two beech wood screws is 640 mm in each direction.

The single board layers are between 18 mm and 100 mm thick. The boards have a width between 140 mm and 210 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

NUR-Holz Solid Timber Elements are intended to be used as structural or non structural wall, roof or floor elements in buildings and timber structures. NUR-Holz Solid Timber Elements may be subjected to actions perpendicular as well as in the plane of the slab.

NUR-Holz Solid Timber Elements shall be subjected to static and quasi static actions only.

NUR-Holz Solid Timber Elements are intended to be used in service classes 1 and 2 according to EN 1995-1-1<sup>7</sup>. 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.

<sup>7</sup> 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 NUR-Holz Solid Timber Elements for the intended use was performed according to the regulations agreed upon within EOTA. Details on the elements are deposited at Deutsches Institut für Bautechnik (DIBt).

### 2.1 Mechanical resistance and stability (ER1)

#### 2.1.1 General

Design and execution of wall, floor, roof or special elements of the NUR-Holz Solid Timber Elements is performed according to EN 1995-1-1<sup>7</sup>. The actions shall be applied according to EN 1991-1-1<sup>8</sup>. Additional national provisions shall be taken into account.

The static verification of the building components of the NUR-Holz Solid Timber Elements 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<sup>7</sup>, 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<sup>9</sup> shall be applied.

For the factor  $k_{mod}$  the value for solid timber applies. The factor  $k_{def}$  can be assumed to be  $2,5 \times k_{def}$  for solid timber as long as at least one layer is crosswise to another.

#### 2.1.2 Specification of the elements

The boards of the single layers are made from European spruce or equivalent softwood. At least 90 % of the load-carrying boards of one layer have to correspond at least to strength class C24. The remaining 10% of the boards shall at least correspond to strength class C16.

The single boards of the layers have a thickness between 18 mm and 100 mm and a width between 140 mm and 210 mm. Butt jointing of the single boards is not allowed. Between the load-carrying layers in longitudinal direction one or two intermediate layers are arranged under an angle of 45° or 90° to the outer layers. 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 one outer layer 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 | ± 1 mm |
| Length            | l | ± 3 mm |
| Width             | b | ± 3 mm |
| Camber            |   | 1:500  |

#### 2.1.3 Specification of the screw fasteners as part of the element

The single layers are connected by wooden screw fasteners. The screws have a thread with an inner thread diameter of 20 mm and an outer diameter of 22 mm. They are driven into a predrilled hole of 20 mm where a thread is formed using a special device.

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.

<sup>8</sup> EN 1991-1-1:2002 + AC:2009      Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings  
<sup>9</sup> EN 338:2009      Structural timber – Strength classes

#### 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 6 %.

### 2.2 Safety in case of fire (ER 2)

#### 2.2.1 General

The essential requirement specified in the Council Directive 89/106/EEC<sup>10</sup> reads as follows:

The construction works must be designed and built in such a way that in the event of an outbreak of fire:

- the load-bearing capacity of the construction can be assumed for specific period of time,
- the generation and spread of fire and smoke within the works are limited,
- occupants can leave the works or be rescued by other means,
- the safety of rescue teams is taken into consideration.

#### 2.2.2 Reaction to fire

In accordance with Commission Decision 2003/43/EC<sup>11</sup> the NUR HOLZ elements 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<sup>12</sup>. For the use as floor construction components they comply with Euroclass D<sub>FL</sub>-s1. The boundary conditions stated in the commission decision have to be attended for this classification.

Note: A European reference fire scenario for façades has not been laid down. In some Member States, the classification of the product according to EN 13501-1<sup>12</sup> might not be sufficient for the use in façades. An additional assessment of the product according to national provisions (e.g. on the basis of a large scale test) might be necessary to comply with Member State regulations, until the existing European classification system has been completed.

#### 2.2.3 Resistance to fire

For the timber members the charring rates given in EN 1995-1-2<sup>13</sup> may be assumed.

No performance has been determined for whole elements.

### 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 the 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.

<sup>10</sup> Council Directive 89/106/EEC of 21.12.1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products, adapted by Council Directive 93/68/EEC of 22.07.1993, adapted by Regulation (EC) No 1882/2003 of the European Parliament and of the Council of 29.09.2003

<sup>11</sup> Official Journal of the European Communities L 13/35, 18. January 2003

<sup>12</sup> EN 13501 1:2007+A1:2009 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

<sup>13</sup> EN 1995-1-2:2004 +AC2009 Eurocode 5: Design of timber structures – Part 1-2: General – Structural fire design

**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.

**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<sup>14</sup>. Calculation can be performed according to EN ISO 6946<sup>15</sup> 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<sup>7</sup>. 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 NUR-Holz Solid Timber Elements shall be marked such that they can be clearly identified.

<sup>14</sup> EN ISO 10456:2007 + AC:2009 Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values

<sup>15</sup> EN ISO 6946:2007 Building components and building elements – Thermal resistance and thermal transmittance – Calculation method

### 3 Evaluation and attestation of conformity and CE marking

#### 3.1 System of attestation of conformity

According to the Commission Decision 97/176/EC<sup>16</sup>, amended by Commission Decision 2001/596/EC<sup>17</sup> of 8 January 2001, on the procedure for attesting the conformity of construction products pursuant to Article 20 (2) of Council Directive 89/106/EEC as regards structural timber products and ancillaries, the system 2+ of attestation of conformity applies to the construction product<sup>18</sup>.

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.
- (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.<sup>19</sup>

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.

<sup>16</sup> Official Journal of the European Communities L 73 of 17.02.1997

<sup>17</sup> Official Journal of the European Communities L 209/33 of 08.01.2001

<sup>18</sup> 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).

<sup>19</sup> 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.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of the European technical approval ETA-11/0338 issued on 17. October 2011.

### 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.

### 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 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 NUR-Holz Solid Timber Elements 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.

Georg Feistel  
Head of Department

*beglaubigt:*  
Warns

**NUR-HOLZ Vollholzelemente**  
Elements jointed with wooden screws made of beech

Annex 1

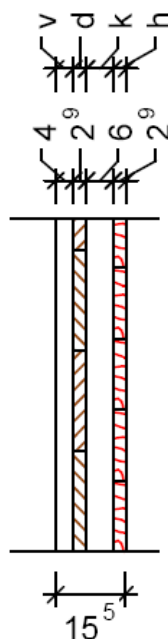
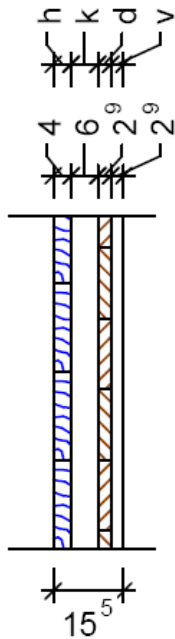
Description of the product

Page 1

**Examples for wall elements**

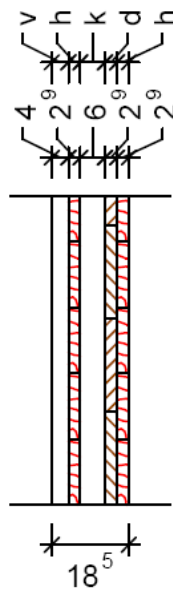
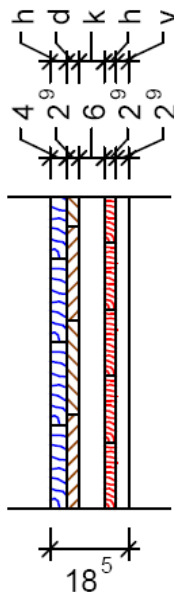
**Wall type 15,5 horizontal**

**Wall type 15,5 vertical**



**Wall type 18,5 horizontal**

**Wall type 18,5 vertical**



v = vertical  
h = horizontal  
d = diagonal  
k = core layer vertical  
All dimensions in cm  
The left side is the visual side

**NUR-HOLZ Vollholzelemente**  
Elements jointed with wooden screws made of beech

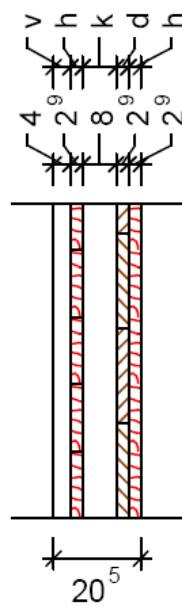
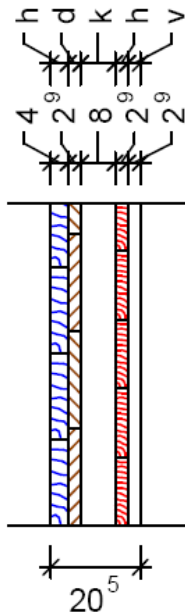
Annex 1

Description of the product

Page 2

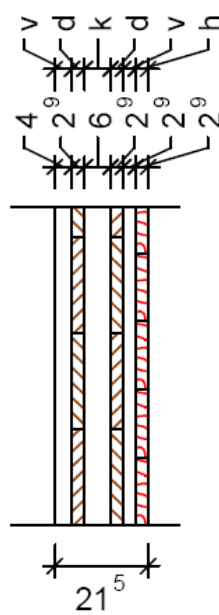
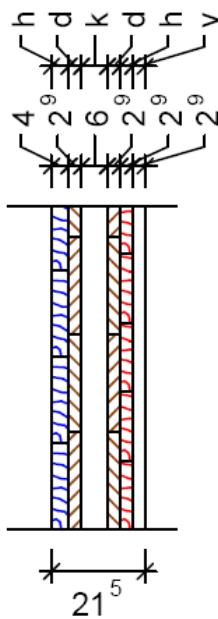
**Wall type 20,5 horizontal**

**Wall type 20,5 vertical**



**Wall type 21,5 horizontal**

**Wall type 21,5 vertical**



v = vertical  
h = horizontal  
d = diagonal  
k = core layer vertical  
All dimensions in cm  
The left side is the visual side

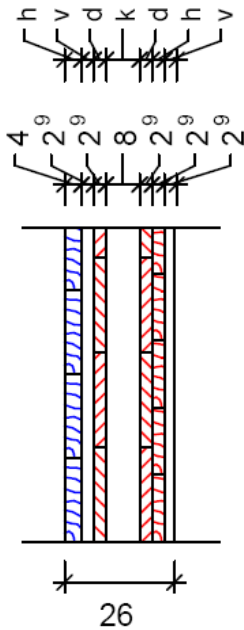
**NUR-HOLZ Vollholzelemente**  
Elements jointed with wooden screws made of beech

Annex 1

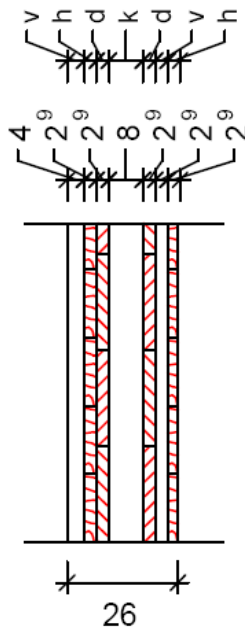
Description of the product

Page 3

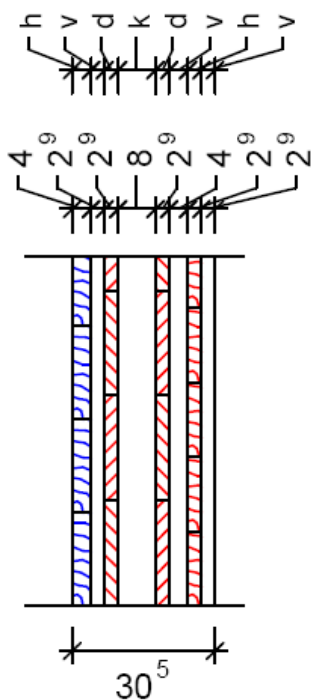
**Wall type 26 horizontal**



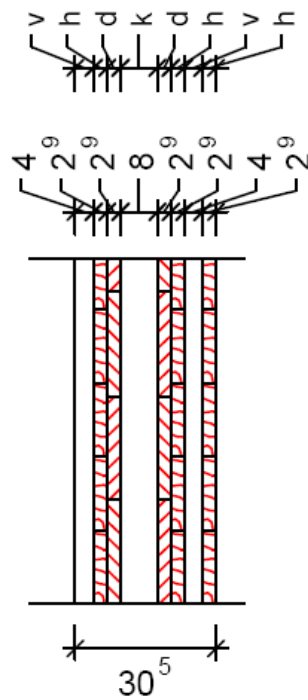
**Wall type 26 vertical**



**Wall type 30,5 horizontal**



**Wall type 30,5 vertical**



v = vertical  
h = horizontal  
d = diagonal  
k = core layer vertical  
All dimensions in cm  
The left side is the visual side

**NUR-HOLZ Vollholzelemente**  
Elements jointed with wooden screws made of beech

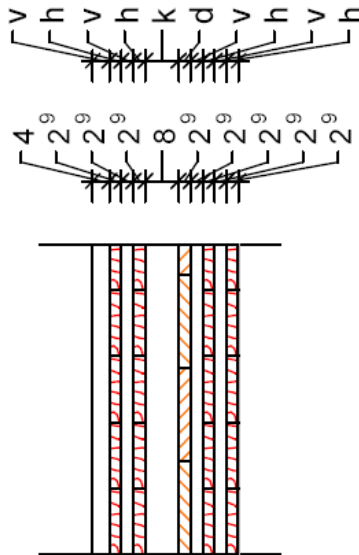
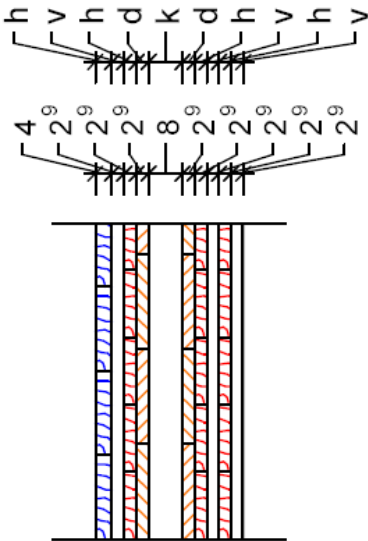
Annex 1

Description of the product

Page 4

**Wall type 35 horizontal**

**Wall type 35 vertical**



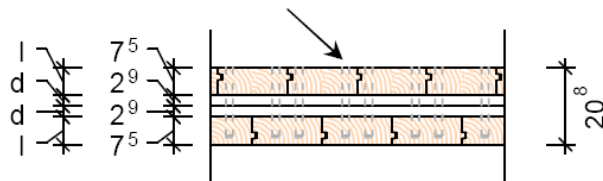
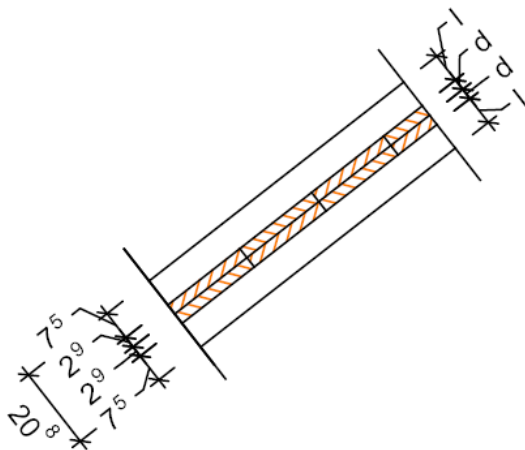
v = vertical  
h = horizontal  
d = diagonal  
k = core layer vertical  
All dimensions in cm  
The left side is the visual side

**Examples for roof and floor elements**

**Roof and floor type 20,8**

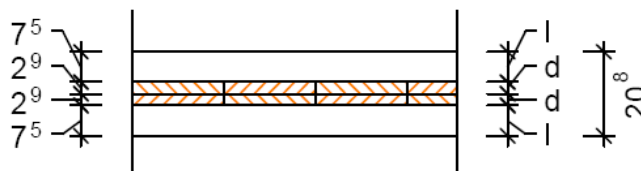
longitudinal section 1

cross section



longitudinal section 2

l = in longitudinal direction  
q = perpendicular to the direction of span  
d = diagonal  
All dimensions in cm



**NUR-HOLZ Vollholzelemente**  
Elements jointed with wooden screws made of beech

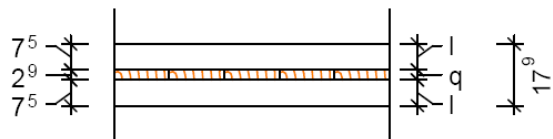
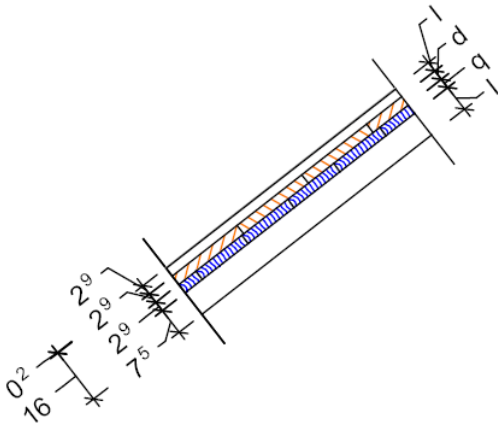
Annex 1

Description of the product

Page 5

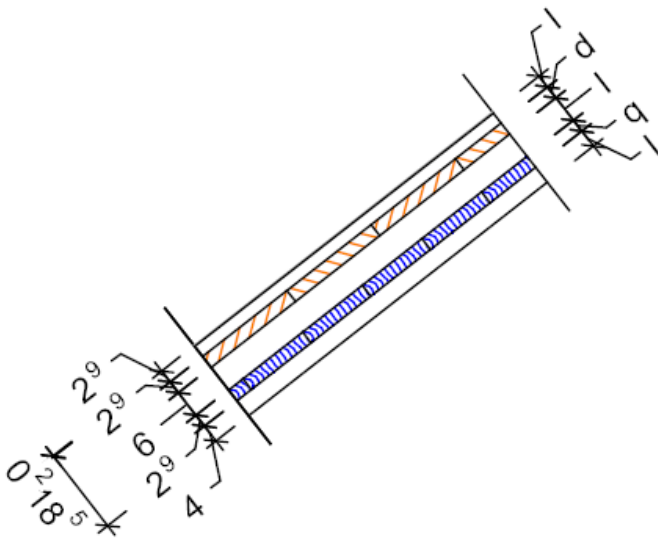
**Roof and floor type 16,0**

**Roof and floor type 17,9**



l = in longitudinal direction  
q = perpendicular to the direction of span  
d = diagonal  
All dimensions in cm

**Roof type 18,5**



l = in longitudinal direction  
q = perpendicular to the direction of span  
d = diagonal  
All dimensions in cm

**NUR-HOLZ Vollholzelemente**  
**Elements jointed with wooden screws made of beech**

**Annex 2**

**Notes for the design calculation**

**Page 1**

**Actions perpendicular to the plane**

The verification of the stress distribution and the internal forces and moments in the NURHolz Solid Timber Elements 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 screw and shear plane between two adjacent board layers of  $K_u = 2400 \text{ N/mm}$  shall be used.

The characteristic lateral load-carrying capacity of a wooden screw  $d = 22 \text{ mm}$  for cross layers consisting of one or two single board layers with a thickness of at not more than 29 mm each is assumed to be 5800 N.

For the serviceability limit state design a slip modulus of  $K_{ser} = 3600 \text{ N/mm}$  should be used.

NUR Holz solid timber elements 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. From the tests an effective width of 70 % of the total width, but not more than 700 mm was determined.

**Actions in plane**

For NUR-Holz wall elements loaded as shear walls an effective shear stiffness value of  $GA = 6,0 \cdot 10^6 \text{ N}$  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  $(GA)_{ef} = 8,0 \cdot 10^6 \text{ N}$  per m of wall length may be assumed.

A maximum displacement of 1/500 of the height of the wall should not be exceeded in the serviceability state. This limit value will in general be governing.

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

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

If NUR-Holz elements 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 NUR-Holz elements 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 shall be taken into account.

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

**NUR-HOLZ Vollholzelemente**  
**Elements jointed with wooden screws made of beech**

**Annex 2**

**Description of the product**

**Page 2**

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.