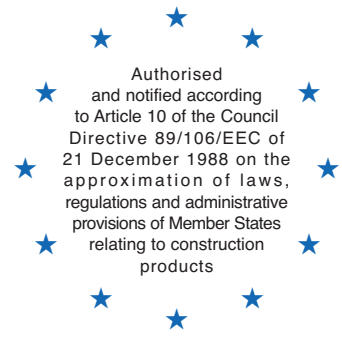


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Member of EOTA

European technical approval ETA-10/0339

English translation, the original version is in German

Handelsbezeichnung <i>Trade name</i>	ARTUSO – CLT
Zulassungsinhaber <i>Holder of approval</i>	Artuso Legnami S.r.l. Via Edificio 19/2 31030 Caselle di Altivole (TV) Italy
Zulassungsgegenstand und Verwendungszweck <i>Generic type and use of construction product</i>	Brettsperrholz (BSP) – Massive plattenförmige Holzbauelemente für tragende Bauteile in Bauwerken <i>Cross Laminated Timber (CLT) – Solid wood slab elements to be used as structural elements in buildings</i>
Geltungsdauer vom <i>Validity from</i> bis zum <i>to</i>	09.11.2010 08.11.2015
Herstellwerk <i>Manufacturing plant</i>	Artuso Legnami S.r.l. Via Edificio 19/2 31030 Caselle di Altivole (TV) Italy

Diese Europäische technische Zulassung umfasst <i>This European technical approval contains</i>	15 Seiten einschließlich 4 Anhängen <i>15 Pages including 4 Annexes</i>
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European Organisation for Technical Approvals
Europäische Organisation für Technische Zulassungen
Organisation Européenne pour l'Agrément technique

I LEGAL BASIS AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Österreichisches Institut für Bautechnik in accordance with:
 1. Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹ – Construction Products Directive –, amended by the Council Directive 93/68/EEC of 22 July 1993²;
 2. *dem Gesetz vom 23. Oktober 2001 über die Beteiligung des Landes Tirol am Österreichischen Institut für Bautechnik, das Inverkehrbringen und die Verwendbarkeit von Bauprodukten und die Akkreditierung von Prüf-, Überwachungs- und Zertifizierungsstellen (Tiroler Bauprodukte- und Akkreditierungsgesetz 2001 – TBAG 2001), LGBl. Nr. 95/2001,*
the law from 23 October 2001 concerning the participation of the Land Tyrol in Österreichisches Institut für Bautechnik, the placing on the market and the use of construction products and the accreditation of testing, inspection and certification bodies (Tyrolean construction products and accreditation law 2001 – TBAG 2001), LGBl. № 95/2001;
 3. Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex of Commission Decision 94/23/EC³.
- 2 Österreichisches Institut für Bautechnik is authorised 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 the 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 Österreichisches Institut für Bautechnik, in particular pursuant to information by the Commission on the basis of 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 may be made with the written consent of Österreichisches 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 to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities № L 40, 11.02.1989, page 12

² Official Journal of the European Communities № L 220, 30.08.1993, page 1

³ Official Journal of the European Communities № L 17, 20.01.1994, page 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of product

1.1.1 General

ARTUSO – CLT is made of softwood boards which are bonded together in order to form cross laminated timber (solid wood slab elements). Generally adjacent layers of the softwood boards are arranged perpendicular (angle of 90 °) to each other, see Annex A, Figure 1.

The principle structure of the cross laminated timber is shown in Annex A, Figure 2 and Figure 3. Surfaces are planed.

The solid wood slab elements consist of at least three adjacent layers and up to five adjacent layers which are arranged perpendicular to each other.

The application of wood preservatives and flame retardants is not subject to the European technical approval.

1.1.2 Wood

Wood species is European spruce or an equivalent softwood.

1.2 Intended use

The solid wood slab is intended to be used as a structural or non structural element in buildings and timber structures.

The solid wood slab shall be subjected to static and quasi static actions only.

The solid wood slab is intended to be used in service classes 1 and 2 according to EN 1995-1-1⁴. 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 the European technical approval are based on an assumed intended working life of cross laminated timber of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer or the Approval Body, but are regarded only as a means for selecting the appropriate product in relation to the expected, economically reasonable working life of the construction works.

2 Characteristics of product and methods of verification

2.1 Characteristics of product

2.1.1 General

ARTUSO – CLT and the boards for its manufacturing correspond to the specifications given in the Annexes A and B. The material characteristics, dimensions and tolerances of ARTUSO - CLT, not indicated in these Annexes, are given in the technical documentation⁵ of the European technical approval.

2.1.2 Boards

The specification of the boards is given in Annex B, Table 1. Boards are visually or machine strength graded. Only technically dried wood shall be used.

⁴ Reference documents are listed in Annex D.

⁵ The technical documentation of the European technical approval is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the approved body involved in the attestation of conformity procedure, is handed over to the approved body.

2.1.3 Adhesive

The adhesive for bonding the cross laminated timber and the finger joints of the individual boards shall conform to EN 301 or EN 15425 and, if relevant, to ETAG 011, Annex C.

For bonding the solid wood slab and the finger joints Polyurethane adhesive (PU) is used.

2.1.4 Hygiene, health and the environment

On dangerous substances ARTUSO – CLT conforms to the CUAP, ETA request № 03.04/06. A manufacturer's declaration to this effect has been submitted.

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.

2.1.5 Identification

The European technical approval for ARTUSO – CLT is issued on the basis of agreed data, deposited with Österreichisches Institut für Bautechnik, which identifies the ARTUSO – CLT that has been assessed and judged. Changes of materials, of composition or characteristics, or to the manufacturing process, which could result in this deposited data being incorrect, should be immediately notified to Österreichisches Institut für Bautechnik before the changes are introduced. Österreichisches Institut für Bautechnik will decide whether or not such changes affect the European technical approval, and, if so, whether further assessment or alterations to the European technical approval are considered necessary.

2.2 Methods of verification

The assessment of the fitness of ARTUSO – CLT for the intended use in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment, for protection against noise, for energy economy and heat retention, as well as for durability in the sense of the Essential Requirements 1, 2, 3, 5 and 6 of Council Directive 89/106/EEC has been made according to the CUAP „Solid wood slab element to be used as a structural element in buildings”, version June 2005, ETA request № 03.04/06.

3 Evaluation of conformity and CE marking

3.1 System of conformity attestation

The system of conformity attestation applied to this product shall be that laid down in the Council Directive 89/106/EEC of 21 December 1988, Annex III (2) (i), referred to as System 1. This system provides for:

Certification of the conformity of the product by an approved certification body on the basis of

(a) Tasks for the manufacturer

- (1) Factory production control;
- (2) Further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan⁶.

⁶ The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the approved body involved in the attestation of conformity procedure.

(b) Tasks for the approved body

- (3) Initial type testing of the product;
- (4) Initial inspection of the factory and of factory production control;
- (5) Continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks for the manufacturer; factory production control

At the manufacturing plant the manufacturer has implemented and continuously maintains a factory production control system. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. The factory production control system ensures that the product is in conformity with the European technical approval.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Checking of incoming materials shall include control of inspection documents (comparison with nominal values) presented by the manufacturer of the raw materials by verifying the dimensions and determining the material properties.

The frequencies of controls and tests conducted during manufacturing and on the assembled cross laminated timber elements are defined by taking account of the manufacturing process of cross laminated timber and are laid down in the prescribed test plan.

The results of factory production control are recorded and evaluated. The records include at least:

- Designation of the product, basic materials and components
- Type of control or testing
- Date of manufacture of the product and date of testing of the product or basic materials or components
- Results of control and testing and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

The records shall be kept at least for five years time and shall be presented to the approved body involved in continuous surveillance. On request they shall be presented to Österreichisches Institut für Bautechnik.

3.2.2 Tasks for the approved body

3.2.2.1 Initial type testing of the product

For initial type-testing, the results of the tests performed as part of the assessment for the European technical approval may be used unless there are changes in the manufacturing process or manufacturing plant. In the case of changes, the necessary initial type-testing shall be agreed between Österreichisches Institut für Bautechnik and the approved body involved.

3.2.2.2 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of cross laminated timber according to the specifications mentioned in section II as well as in the Annexes of the European technical approval.

3.2.2.3 Continuous surveillance

The approved body shall visit the factory at least once a year for surveillance. It shall be verified that the system of factory production control and the specified manufacturing process are maintained, taking account of the prescribed test plan. On demand the results of continuous surveillance shall be made available by the approved body to Österreichisches Institut für Bautechnik. When the provisions of the European technical approval and the prescribed test plan are no longer fulfilled, the certificate of conformity shall be withdrawn.

3.3 CE marking

The CE marking shall be affixed on the accompanying commercial documents. The symbol “CE” shall be followed by the identification number of the certification body and shall be accompanied by the following additional information:

- Name or identifying mark and address of manufacturer
- Number of the certificate of conformity
- Last two digits of the year in which the CE marking was affixed
- Number of the European technical approval
- Species of wood used
- Number and orientation of layers
- Nominal thickness of the solid wood slab

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

4.1 Manufacturing

ARTUSO – CLT is manufactured in accordance with the provisions of the European technical approval using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical documentation.

Layers of planed boards shall be bonded together to the required thickness of the cross laminated timber. The individual boards shall be jointed in longitudinal direction by means of finger joints according to EN 385, there shall be no butt joints.

Adhesive shall be applied on one face of each board. The edges of the boards need not to be bonded.

4.2 Installation

4.2.1 Design of cross laminated timber

The European technical approval only applies to the manufacture and use of cross laminated timber. Verification of stability of the works including application of loads on cross laminated timber is not subject to the European technical approval.

Fitness for the intended use of cross laminated timber is given under the following conditions.

- Design of cross laminated timber members is carried under the responsibility of an engineer experienced in solid wood slab elements.
- Design of the works shall account for the protection of cross laminated timber.
- The cross laminated timber members are installed correctly.

Design of cross laminated timber elements may be according to EN 1995-1-1 and EN 1995-1-2, taking into account the Annexes B and C of the European technical approval.

Standards and regulations in force at the place of use shall be considered.

4.2.2 Installation of cross laminated timber

The manufacturer shall prepare installation instructions in which the product-specific characteristics and the most important measures to be taken into consideration for installation are described. The installation instructions shall be available at every construction site and shall be deposited at Österreichisches Institut für Bautechnik.

Cross laminated timber installation shall be carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site. An assembly plan shall be prepared for each structure, which contains the sequence in which the individual members of cross laminated timber shall be installed and the designation of the members of cross laminated timber. The assembly plan shall be available at the construction site.

The safety-at-work and health protection regulations have to be observed.

5 Recommendations for 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 cross laminated timber.

5.2 Recommendations on packaging, transport and storage

Cross laminated timber 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 Recommendations for use, maintenance and repair of the works

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 member of cross laminated timber immediate actions regarding the mechanical resistance and stability of the works shall be initiated.

On behalf of Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits
Managing Director

ANNEX A

Structure of cross laminated timber

Figure 1: Principle structure of the solid wood slab

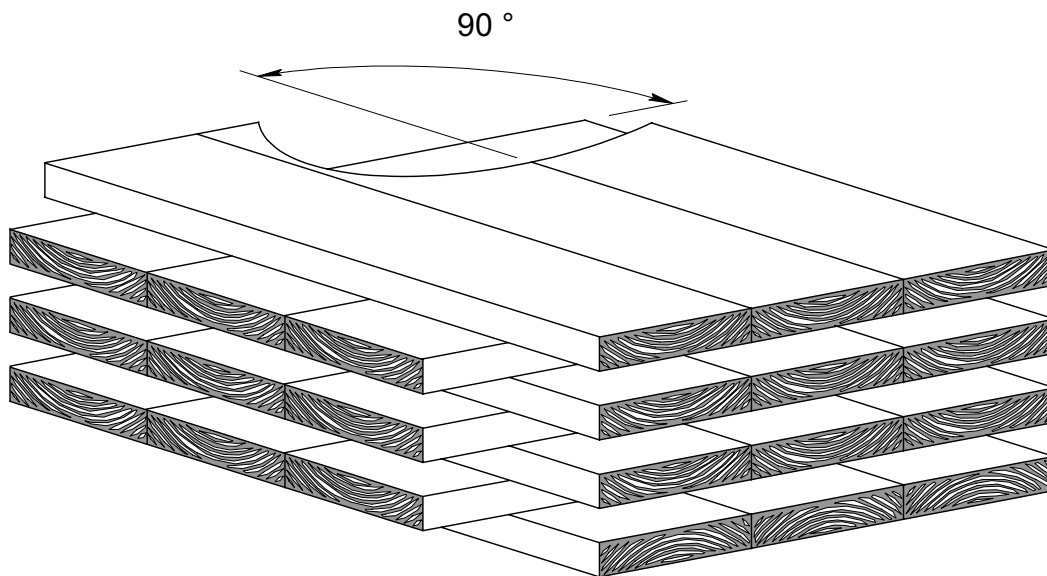


Figure 2: Principle structure of a cross laminated timber with 3 layers

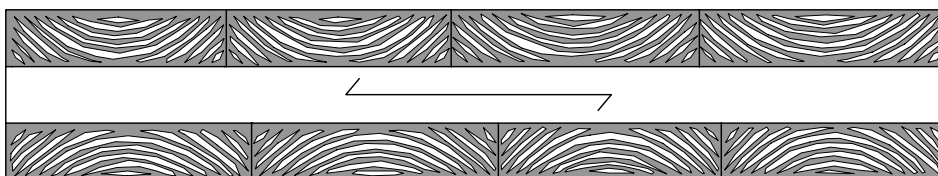
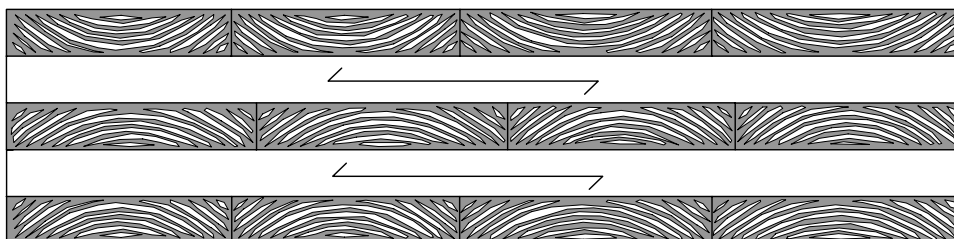


Figure 3: Principle structure of a cross laminated timber with 5 layers



ANNEX B
Characteristic data of cross laminated timber

Table 1: Dimensions and specifications

Characteristic		Dimension / Specification
Cross laminated timber		
Thickness	mm	95 to 160
Width	m	≤ 3.0
Length	m	≤ 10
Number of layers	—	3 or 5
Maximum width of joints between boards within one layer	mm	3
Board		
Surface	—	planed
Thickness (planed dimension)	mm	32
Width	mm	140 to 240
Ratio width to thickness	—	≥ 4 : 1
Boards shall be graded with suitable visual and/or machine procedures to be able to assign them to a strength class according to EN 338.	—	
Cover layer		C24
Inner layer		≤ 10 % C18 ≥ 90 % C24
Moisture of wood according to EN 13183-2	%	13 ± 2
Finger joints	—	EN 385

Table 2: Product characteristics of the solid wood slab

ER	Requirement	Verification method	Class / Use category / Numeric value
1	Mechanical resistance and stability		
	1. Mechanical actions perpendicular to cross laminated timber		
	Strength class of boards	EN 338	C24
	Modulus of elasticity		
	– parallel to the grain of the boards $E_{0, mean}$	I_{eff} ; Annex 4 CUAP 03.04/06, 4.1.1.1	11 600 MPa ¹⁾
	– perpendicular to the grain of the boards $E_{90, mean}$	EN 338	370 MPa
	Shear modulus		
	– parallel to the grain of the boards $G_{090, mean}$	EN 338	690 MPa
	– perpendicular to the grain of the boards (rolling shear modulus) $G_{9090, mean}$	CUAP 03.04/06, 4.1.1.1	50 MPa
	Bending strength		
– parallel to the grain of the boards $f_{m, k}$	W_{eff} ; Annex 4 CUAP 03.04/06, 4.1.1.1	26 MPa ⁷	
Tensile strength			
– perpendicular to the grain of the boards $f_{t, 90, k}$	EN 338, reduced	0.12 MPa	
Compressive strength			
– perpendicular to the grain of the boards $f_{c, 90, k}$	EN 338	2.5 MPa	
Shear strength			
– parallel to the grain of the boards $f_{v, 090, k}$	EN 338	4.0 MPa	
– perpendicular to the grain of the boards (rolling shear strength) $f_{v, 9090, k}$	A_{gross} ; Annex 4 CUAP 03.04/06, 4.1.1.3	1.25 MPa	

NOTE

¹⁾ 1 MPa = 1 N/mm²

⁷ For solid wood slabs with an width of at least $b \geq 1.0$ m. For smaller solid wood slabs $f_{m, k} = 24$ MPa.

ER	Requirement	Verification method	Class / Use category / Numeric value
1	Mechanical resistance and stability		
	2. Mechanical actions in plane of cross laminated timber		
	Strength class of boards	EN 338	C24
	Modulus of elasticity – parallel to the grain of the boards $E_{0, mean}$	A_{net}, I_{net} , Annex 4 CUAP 03.04/06, 4.1.2.1	11 600 MPa
	Shear modulus – parallel to the grain of the boards $G_{090, mean}$	A_{net} , Annex 4 CUAP 03.04/06, 4.1.2.3	450 MPa
	Bending strength – parallel to the grain of the boards $f_{m, k}$	W_{net} , Annex 4 CUAP 03.04/06, 4.1.2.1	24 MPa
	Tensile strength – parallel to the grain of the boards $f_{t, 0, k}$	EN 338	14 MPa
	Compressive strength – parallel to the grain of the boards $f_{c, 0, k}$	EN 338	21 MPa
	Shear strength – parallel to the grain of the boards $f_{v, 090, k}$	A_{net} , Annex 4 CUAP 03.04/06, 4.1.2.3	4.0 MPa
	3. Other mechanical actions		
	Creep and duration of load	EN 1995-1-1	
	Dimensional stability Moisture content during service shall not change to such an extent that adverse deformation will occur.		
	Fasteners	EN 1995-1-1	
2	Reaction to fire		
	Solid wood panels excluding floorings	Commission Decision 2003/43/EC	Euroclass D-s2, d0
	Floorings of solid wood panels		Euroclass D _f -s1
	Resistance to fire		
	Charring rate – Charring of more layers than the cover layer.	EN 1995-1-2	0.6 mm/min

ER	Requirement	Verification method	Class / Use category / Numeric value
3	Hygiene, health and environment		
	Vapour permeability, μ , including joints within the layers	EN ISO 10456	50 to 200
5	Protection against noise		
	Airborne sound insulation – Plain wall, thickness of 160 mm	EN 12354-1	approx. 37 dB
	Impact sound insulation	No performance determined	
	Sound absorption	Not relevant	
6	Energy economy and heat retention		
	Thermal conductivity, λ	EN ISO 10456	0.13 W/(m·K)
	Air tightness / Air permeability	EN 12114	Class 4 according to EN 12207
	Thermal inertia, specific heat, c_p	EN ISO 10456	1600 J/(kg·K)
–	Durability		
	Durability of timber Service classes	EN 1995-1-1	1 and 2

ANNEX C

Design consideration for cross laminated timber

Mechanical actions perpendicular to plane and in plane of cross laminated timber

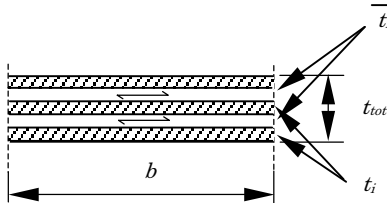
General

Due to the perpendicular orientation of the boards, cross laminated timber is able to transfer loads in all directions according to its condition of support. For cross laminated timber multi-axle stressed in both principal directions, different stiffness for the two principal directions shall be considered.

For calculation of characteristic values of cross-section, only boards which are oriented in direction of mechanical action may be employed.

For design of cross laminated timber according to EN 1995-1-1, characteristic strength and stiffness of solid wood according to Annex B shall be taken.

Mechanical actions perpendicular to cross laminated timber



Where

- t_i Thickness of board layers in direction of mechanical actions
 \bar{t}_i Thickness of board layers perpendicular to direction of mechanical actions

The bending stiffness is specified in relation to the effective moment of inertia I_{eff} .

The calculation of the effective moment of inertia and therewith of the effective bending stiffness is according to EN 1995-1-1.

For I_{eff} see clause 9.1.3 and Annex B of EN 1995-1-1.

The term $\frac{S_i}{K_i}$ of EN 1995-1-1 should be substituted by $\frac{\bar{t}_i}{G_{9090} \cdot b}$.

$$I_i = \frac{b \cdot t_i^3}{12}$$

$$A_i = b \cdot t_i$$

$$\tau_{v,d} = \frac{1.5 \cdot V_d}{A_{gross}}$$

$$W_{eff} = \frac{2 \cdot I_{eff}}{t_{tot}}$$

$$h_{tot} = \sum_i (t_i + \bar{t}_i)$$

$$A_{gross} = b \cdot t_{tot}$$

Where

I moment of inertia

I_{eff} effective moment of inertia

s spacing of fasteners according to EN 1995-1-1 (not relevant for solid wood slab)

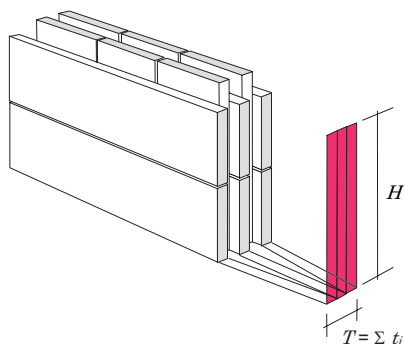
K slip modulus according to EN 1995-1-1 (not relevant for solid wood slab)

G_{9090} shear modulus of the board perpendicular to grain (rolling shear modulus);

$$G_{9090} = 50 \text{ MPa}$$

b width of the member of cross laminated timber

Mechanical actions in plane of the solid wood slab



Where

$H \leq 400$ mm

t_i Thickness of board layers in direction of mechanical actions

\bar{t}_i Thickness of board layers perpendicular to direction of mechanical actions

V Shear force

Under the terms of the technical beam theory the following equations may be used.

Moment of inertia

$$I_{net} = \frac{T \cdot H^3}{12}$$

Shear strength

$$\tau_{v,d} = \text{Maximum} \begin{cases} \frac{3}{2} \cdot \frac{V_d}{A_{x,net}} \\ \frac{3}{2} \cdot \frac{V_d}{A_{z,net}} \end{cases}$$

Section modulus

$$W_{net} = \frac{T \cdot H^2}{6}$$

$$A_{x,net} = H \cdot \sum_i \bar{t}_i$$

$$A_{z,net} = H \cdot \sum_i t_i$$

ANNEX D

Reference documents

- CUAP (Common Understanding of Assessment Procedure), ETA request № 03.04/06, Version June 2005: Solid wood slab element to be used as a structural element in buildings
- ETAG 011 (01.2002): Guideline for European technical approvals for Light Composite Wood-based Beams and Columns
- EN 301 (06.2006): Adhesives phenolic and aminoplastic, for load bearing timber structures – Classification and performance requirements
- EN 338 (10.2009): Structural timber – Strength classes
- EN 385 (10.2001): Finger jointed structural timber – Performance requirements and minimum production requirements
- EN 1995-1-1 (11.2004), AC (06.2006) and A1 (06.2008): Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings
- EN 1995-1-2 (11.2004) and AC (03.2009): Eurocode 5 – Design of timber structures – Part 1-2: General - Structural fire design
- EN 12114 (03.2000): Thermal performance of buildings – Air permeability of building components and building elements – Laboratory test method
- EN 12207 (11.1999): Windows and doors – Air permeability – Classification
- EN 12354-1 (04.2000): Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 1: Airborne sound insulation between rooms
- EN 13183-2 (04.2002) and AC (09.2003): Moisture content of a piece of sawn timber – Part 2: Estimation by electrical resistance method; and: EN 13183-2/AC (2003-09): Moisture content of a piece of sawn timber – Part 2: Estimation by electrical resistance method; Amendment AC
- EN 15425 (02.2008): Adhesives – One component polyurethane for load bearing timber structures - Classification and performance requirements
- EN ISO 10456 (12.2007) and AC (12.2009): Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)
- 2003/43/EC, Commission Decision of 17 January 2003 establishing the classes of reaction-to-fire performance for certain construction products, OJ. L 013 from 18.1.2003, page 35; as amended by OJ. L 201 from 8.8.2003, page 25, OJ. L 276 from 7.10.2006, page 77 and OJ. L 131 from 23.5.2007, page 21