





European Technical Assessment

ETA-12/0281 of 09.11.2020

General part

Technical Assessment Body issuing the European Technical Assessment

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of

This European Technical Assessment replaces

Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering

HASSLACHER CROSS LAMINATED TIMBER

Solid wood slab elements to be used as structural elements in buildings

Hasslacher Holding GmbH Feistritz 1 9751 Sachsenburg Austria

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17 pages including 4 Annexes which form an integral part of this assessment.

European Assessment Document (EAD) 130005-00-0304 "Solid wood slab element to be used as a structural element in buildings".

European Technical Assessment ETA-12/0281 of 13.07.2018.



Remarks

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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Specific parts

1 Technical description of the product

1.1 General

This European Technical Assessment¹ (ETA) applies to the cross laminated timber "HASSLACHER CROSS LAMINATED TIMBER". The product 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 1, Figure 1.

The principle structure of the cross laminated timber is shown in Annex 1, Figure 2 and Figure 3. Surfaces are planed or sanded.

The solid wood slab elements consist of at least three and up to eleven adjacent layers which are arranged perpendicular to each other. With regard to the thickness of the solid wood slab element, thickness and orientation of individual layers are symmetrically assembled. In case of serious deviations from symmetry potential effects should be investigated.

The individual boards of the layers running parallel to the longitudinal direction of the element (longitudinal layers) may be side-glued.

In multilayer elements with at least five layers, a maximum of two consecutive board layers may be arranged in the same direction if their all over thickness does not exceed 90 mm.

Single board layers (maximum 50 % of the cross section) may be replaced by one- and multilayer solid wood panels. The solid wood panels shall be suitable for structural use.

One cover layer may be substituted by lamellae type "excellent".

The surfaces of the solid wood slabs may be provided with wood-based panels.

HASSLACHER CROSS LAMINATED TIMBER and the boards for its manufacturing correspond to the specifications given in the Annexes 1 and 2. The material characteristics, dimensions and tolerances of the product, not indicated in these Annexes, are given in the technical file² of the European Technical Assessment.

The application of wood preservatives and flame retardants is not subject of the European Technical Assessment.

1.2 Components

1.2.1 Boards

The specification of the boards is given in Annex 2, Table 2. Boards are visually or machine strength graded. Only technically dried wood shall be used.

Wood species is European spruce or equivalent softwood.

The ETA-12/0281 was firstly issued in 2012 as European technical approval with validity from 20.08.2012, converted in 2017 to the European Technical Assessment ETA-12/0281 of 28.07.2017, amended to ETA-12/0281 of 13.07.2018 and amended to ETA-12/0281 of 09.11.2020.

² The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the notified product certification body involved in the assessment and verification of constancy of performance procedure, is handed over to the notified product certification body.



1.2.2 Lamellae type "excellent"

The specification of the lamellae type "excellent" is given in Annex 2, Table 2. Lamellae are composed of a bearing lamellae as well as a transverse lamellae of European spruce and a cover lamellae of European spruce or equivalent softwood, birch or oak or equivalent hardwood. Bearing lamellae, transverse lamellae and cover lamellae are visually or machine strength graded. Only technically dried wood shall be used.

1.2.3 Wood-based panels

The specification of the wood-based panels is given in Annex 2, Table 2. Wood-based panels are in accordance with EN 13986 or a European Technical Assessment.

1.2.4 Adhesive

The adhesive for bonding of the cross laminated timber and the finger joints of the individual boards shall conform to EN 301.

Normally a MUF adhesive is used.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (thereafter EAD)

2.1 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 1995-1-1³. Members which are directly exposed to the weather shall be provided with an effective protection for the solid wood slab element in service.

2.2 General assumptions

The solid wood slab elements are manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical file.

The manufacturer shall ensure that the requirements in accordance with the Clauses 1, 2 and 3 as well as with the Annexes of the European Technical Assessment are made known to those who are concerned with design and execution of the works.

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 14080, 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.

Design

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

The following conditions shall be observed:

- Design of cross laminated timber members is carried out under the responsibility of an engineer experienced in such products.
- Design of the works shall account for the protection of the cross laminated timber.
- The cross laminated timber members are installed correctly.

Reference documents are listed in Annex 4.



Design of cross laminated timber members elements may be according to EN 1995-1-1 and EN 1995-1-2, taking into account of Annexes 2 and 3 of the European Technical Assessment.

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

Packaging, transport, storage, maintenance, replacement and repair

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

Installation

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

2.3 Assumed working life

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life of HASSLACHER CROSS LAMINATED TIMBER of 50 years, when installed in the works, provided that the cross laminated timber elements are subject to appropriate installation, use and maintenance (see Clause 2.2). These provisions are based upon the current state of the art and the available knowledge and experience⁴.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA nor by the Technical Assessment Body, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product can also be shorter than the assumed working life.



Performance of the product and reference to the methods used for its assessment

Essential characteristics of the product

Table 1: Essential characteristics of the product and assessment methods

Nº	Essential characteristic	Product performance	
Basic requirement for construction works 1: Mechanical resistance and stability 1)			
1	Bending ²⁾	Annex 2	
2	Tension and compression ²⁾	Annex 2	
3	Shear ²⁾	Annex 2	
4	Embedment strength	Annex 2	
5	Creep and duration of the load	Annex 2	
6	Dimensional stability	Annex 2	
7	In-service environment	Annex 2	
8	Bond integrity	Annex 2	
	Basic requirement for construction works 2	2: Safety in case of fire	
9	Reaction to fire	Annex 2	
10	Resistance to fire	Annex 2	
Basic requirement for construction works 3: Hygiene, health and the environment			
11	Content, emission and/or release of dangerous substances	3.1.1	
12	Water vapour permeability – Water vapour transmission	Annex 2	
	Basic requirement for construction works 4: Saf	ety and accessibility in use	
13	Impact resistance	Annex 2	
	Basic requirement for construction works 5:	Protection against noise	
14	Airborne sound insulation	No performance assessed.	
15	Impact sound insulation	No performance assessed.	
16	Sound absorption	No performance assessed.	
	Basic requirement for construction works 6: Energ	y economy and heat retention	
17	Thermal conductivity	Annex 2	
18	Air permeability	No performance assessed.	
19	Thermal inertia	Annex 2	
1) The	1) These characteristics also relate to basic requirement for construction works 4.		

These characteristics also relate to basic requirement for construction works 4.

²⁾ Load bearing capacity and stiffness regarding mechanical actions perpendicular to and in plane of the solid wood slab element.



3.1.1 Hygiene, health and the environment

The release of dangerous substances is determined according to EAD 130005-00-0304, "Solid wood slab element to be used as a structural element in buildings". No dangerous substances is the performance of the HASSLACHER CROSS LAMINATED TIMBER in this respect.

NOTE In addition to the specific clauses relating to dangerous substances contained in the European Technical Assessment, 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 Regulation, these requirements need also to be complied with, when and where they apply.

3.2 Assessment methods

3.2.1 General

The assessment of the essential characteristics in Clause 3.1 of HASSLACHER CROSS LAMINATED TIMBER for the intended use, and in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment, for safety and accessibility in use and for energy economy and heat retention in use in the sense of the basic requirements for construction works № 1, 2, 3, 4 and 6 of Regulation (EU) № 305/2011 has been made in accordance with the European Assessment Document EAD 130005-00-0304, Solid wood slab element to be used as a structural element in buildings.

3.2.2 Identification

The European Technical Assessment for HASSLACHER CROSS LAMINATED TIMBER is issued on the basis of agreed data that identify the assessed product. Changes to materials, to composition, to characteristics of the product, or to the production process could result in these deposited data being incorrect. Österreichisches Institut für Bautechnik should be notified before the changes are implemented, as an amendment of the European Technical Assessment is possibly necessary.

4 Assessment and verification of constancy of performance (thereafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performance

According to Commission Decision 97/176/EC the system of assessment and verification of constancy of performance to be applied to HASSLACHER CROSS LAMINATED TIMBER is System 1. System 1 is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.2., and provides for the following items

- (a) The manufacturer shall carry out
 - (i) factory production control;
 - (ii) further testing of samples taken at the manufacturing plant by the manufacturer in accordance with a prescribed test plan⁵;
- (b) The notified product certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of constancy of performance of the construction product on the basis of the outcome of the following assessments and verifications carried out by that body:
 - (i) an assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product;
 - (ii) initial inspection of the manufacturing plant and of factory production control;
 - (iii) continuous surveillance, assessment and evaluation of factory production control.

The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the notified product certification body involved in the procedure for the assessment and verification of constancy of performance. The prescribed test plan is also referred to as control plan.



4.2 AVCP for construction products for which a European Technical Assessment has been issued

Notified bodies undertaking tasks under System 1 shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Notified bodies shall therefore not undertake the tasks referred to in point 4.1 (b)(i).

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

5.1 Tasks for the manufacturer

5.1.1 Factory production control

In the manufacturing plant the manufacturer shall establish and continuously maintain a factory production control. All procedures and specification adopted by the manufacturer shall be documented in a systematic manner. The factory production control shall ensure the constancy of performances of HASSLACHER CROSS LAMINATED TIMBER with regard to the essential characteristics.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents presented by the manufacturer of the raw materials.

The frequencies of controls conducted during manufacturing and on the assembled product are defined by taking account of the manufacturing process of the product and are laid down in the control plan.

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

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

The records shall be kept at least for ten years time after the construction product has been placed on the market and shall be presented to the notified product certification body involved in continuous surveillance. On request they shall be presented to Österreichisches Institut für Bautechnik.

5.1.2 Declaration of performance

The manufacturer is responsible for preparing the declaration of performance. When all the criteria of the assessment and verification of constancy of performance are met, including the certificate of conformity issued by the notified product certification body, the manufacturer shall draw up a declaration of performance.



5.2 Tasks for the notified product certification body

5.2.1 Initial inspection of the manufacturing plant and of factory production control

The notified product certification body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of HASSLACHER CROSS LAMINATED TIMBER according to the European Technical Assessment. In particular the following items shall be appropriately considered

- Personnel and equipment
- The suitability of the factory production control established by the manufacturer
- Full implementation of the control plan
- 5.2.2 Continuous surveillance, assessment and evaluation of factory production control

The notified product certification body shall visit the factory at least once a year for routine inspection. In particular the following items shall be appropriately considered

- The manufacturing process including personnel and equipment
- The factory production control
- The implementation of the control plan

The results of continuous surveillance are made available on demand by the notified product certification body to Österreichisches Institut für Bautechnik. When the provisions of the European Technical Assessment and the control plan are no longer fulfilled, the certificate of constancy of performance is withdrawn by the notified product certification body.

Issued in Vienna on 09.11.2020 by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits

Managing Director



Figure 1: Principle structure of the solid wood slab (e.g. cross laminated timber with 7 layers)

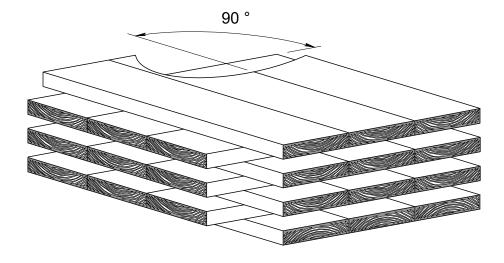


Figure 2: Principle structure of cross laminated timber with 3 layers

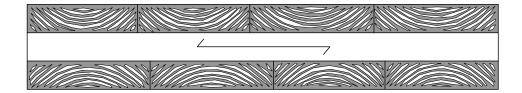
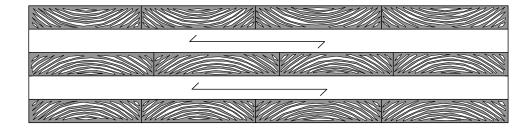


Figure 3: Principle structure of cross laminated timber with 5 layers



HASSLACHER CROSS LAMINATED TIMBER	Annex 1	
Structure of cross laminated timber	of European Technical Assessment ETA-12/0281 of 09.11.2020	



Table 2: Dimensions and specifications

Item	Item Dimension / Specification		
Cro	ss lam	inated timber	
Thickness	mm	57 to 36	60
Width	m	≤ 4.0	
Length	m	≤ 20.0)
Number of layers	_	3 to 1 symmetric ass	
Maximum width of joints between boards within one layer	mm	3	
	В	pards	
Surface	_	planed or s	anded
Thickness (planed dimension)		19 to 45 30 to 45 for boards of strength class C40/L40/T26	
Width	mm	80 to 30	00
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.		CL26E11.8	CL36E14.7 3s, 5s, 7s, 9s 5ss, 7ss, 9ss 4)
Cover layer		C24,L25 ²⁾ or T14 ³⁾	C40,L40 ²⁾ or T26 ³⁾
Inner layer		\leq 30 % C16, L17 $^{2)}$ or T11 $^{3)}$ \geq 70 % C24, L25 $^{2)}$ or T14 $^{3)}$	C24,L25 ²⁾ or T14 ³⁾
Moisture of wood according to EN 13183-2	%	11 ± 2	2
Finger joints		EN 140	80

NOTE

- 1) In case of additional application of fire protection boards, a deviation from the symmetric assembly is allowed. The fire protection board and its application is not subject of this European Technical Assessment.
- ²⁾ According to EN 14081-4.
- 3) According to EN 338.
- 4) In case of two consecutive cover layers the same strength class is used.

HASSLACHER CROSS LAMINATED TIMBER	Annex 2	
Characteristic data of cross laminated timber	of European Technical Assessment ETA-12/0281 of 09.11.2020	



Item		Dimension / Specification	
Lamellae type "excellent"	_	Z-737: 7 -3-7 spruce Z-9520: 9 -5-20 spruce Z-8527: 8 -5-27 spruce Z-FiBi: 7 -5-21 birch Z-FiEi: 7 -5-21 oak Z-FiZi: 7 -5-21 pine	
Wood-based panels		EN 13986	

HASSLACHER CROSS LAMINATED TIMBER	Annex 2	
Characteristic data of cross laminated timber	of European Technical Assessment ETA-12/0281 of 09.11.2020	



Table 3: Product characteristics of the solid wood slab

BWR	Essential characteristic	Assessment method	Level / Class	Description	
1	Mechanical resistance and stability				
	1. Mechanical actions perpendicular to cross laminated timber				
	Strength class of boards	EN 338	CL26E11.8	CL36E14.7	
	Modulus of elasticity				
	 parallel to the grain of the boards $E_{0, mean}$ 	I _{eff} , Annex 3 EAD 130005-00-0304, 2.2.1.1	11 800 MPa ¹⁾	14 700 MPa ²⁾ 14 600 MPa ³⁾ 14 400 MPa ⁴⁾ 14 000 MPa ⁵⁾	
	 perpendicular to the grain of the boards $E_{90, mean}$ 	EN 338	370	Ma	
	Shear modulus				
	 parallel to the grain of the boards $G_{090, mean}$ 	EN 338	690 N	ИРа	
	 perpendicular to the grain of the boards (rolling shear modulus) $G_{9090, mean}$ 	EAD 130005-00-0304, 2.2.1.1	50 M	1Pa	
	Bending strength				
	 parallel to the grain of the boards $f_{m, k}$ 	<i>W_{eff}</i> , Annex 3 EAD 130005-00-0304, 2.2.1.1	1/ <i>k</i> _{sys} · 26.4 MPa	1/ <i>k</i> _{sys} · 36 MPa	
	Tensile strength				
	 perpendicular to the grain of the boards $f_{t, 90, k}$ 	EN 338, reduced	0.12 I	МРа	
	Compressive strength				
	 perpendicular to the grain of the boards $f_{c, 90, k}$ 	EN 338	2.5 N	ЛРа	

NOTE

- $^{1)}$ 1 MPa = 1 N/mm²
- ²⁾ for lay-up 3s, 5s, 5ss and 7ss
- 3) for lay-up 9ss
- 4) for lay-up 7s
- 5) for lay-up 9s

6)
$$k_{sys} = \max \begin{cases} 1, 1 - 0,025 \cdot n \\ 1 \end{cases}$$

7) Initial assessment: COV < 15 %

n ... number of boards within cover layer

HASSLACHER CROSS LAMINATED TIMBER	Annex 2
Characteristic data of cross laminated timber	of European Technical Assessment ETA-12/0281 of 09.11.2020



		1		
BWR	Essential characteristic	Assessment method	Level / Class	/ Description
	Shear strength			
	 parallel to the grain of 	EN 338		
	the boards $f_{v,\ \partial \partial \partial,\ k}$		4.01	MPa
	 perpendicular to the grain of the boards (rolling shear strength) 	<i>A_{gross}</i> , Annex 3 EAD 130005-00-0304, 2.2.1.3		
	$f_{v, 9090, k}$	2.2.1.0	1.5	MPa
	2. Mechanical actions in p	lane of cross laminated	l timber	
	Strength class of boards	EN 338	CL26E11.8	CL36E14.7
	Modulus of elasticity			
	- parallel to the grain of the boards $E_{\it 0, mean}$	A _{net} , I _{net} , Annex 3 EAD 130005-00-0304, 2.2.1.1		14 700 MPa ²⁾ 14 600 MPa ³⁾ 14 400 MPa ⁴⁾
			11 600 MPa	14 000 MPa ⁵⁾
	Shear modulus			
	$-$ parallel to the grain of the boards $G_{\it 090, mean}$	<i>A_{net}</i> , Annex 3 EAD 130005-00-0304, 2.2.1.3	250	MPa
	Bending strength			
	 parallel to the grain of the boards $f_{m, k}$ 	<i>W</i> _{net} , Annex 3 EAD 130005-00-0304, 2.2.1.1	24 MPa	34.5 MPa
	Tensile strength			
	 parallel to the grain of the boards f_t, g, k 	EN 338	14 MPa	19.5 MPa
	Compressive strength			
	- parallel to the grain of the boards f_c , g , k	EN 338	21 MPa	24.5 MPa
	Shear strength			ı
	- parallel to the grain of the boards $f_{v,\; \partial 90,\; k}$	A _{net} , Annex 3 EAD 130005-00-0304, 2.2.1.3	4.0 M	1Pa ⁸⁾
NOTE		2.2.1.3	4.0 N	″ira

NOTE 8)

HASSLACHER CROSS LAMINATED TIMBER	Annex 2
Characteristic data of cross laminated timber	of European Technical Assessment ETA-12/0281 of 09.11.2020

⁸⁾ Related to $A_{x,net}$ or $A_{z,net}$.



BWR	Essential characteristic	Assessment method	Level / Class / Description		
	3. Other mechanical actio	ns			
	Creep and duration of load	k_{mod} and k_{def} according timber	to EN 1995-1-1 for glued laminated		
	Dimensional stability Moisture content during service shall not change to such an extend that adverdeformation will occur.				
	Fasteners	EN 1995-1-1, the directi taken as reference	on of grain of the cover layer shall be		
	In-service environment				
	Durability of timber	EN 1995-1-1			
	Service classes		1 and 2		
	Bond integrity	EAD 130005-00-0304	Pass		
2	Reaction to fire				
	Glued laminated timber products	Commission Decision 2005/610/EC	Mean density of wood ≥ 380 kg/m³ Euroclass D-s2, d0		
	Resistance to fire				
	Charring rate of lamellas 9)	EN 1995-1-2			
	- β ₀ - β _n		0.65 mm/min 0.8 mm/min		
3	Hygiene, health and envir	onment			
	Vapour permeability, μ, including joints within the layers	EN ISO 10456	50 (dry) to 20 (wet)		
4	-		30 (dry) to 20 (wet)		
4	Safety and accessibility in use				
	Impact resistance	Soft body resistance is assumed to be fulfilled for walls with a minimum of 3 layers and minimum thickness of 60 mm.			
6	Energy economy and heat retention				
	Thermal conductivity, λ	EN ISO 10456	0.12 W/(m·K)		
	Thermal inertia, specific heat capacity c _p	EN ISO 10456	1 600 J/(kg·K)		

Otherring rates are used in the simplified bilinear model of clause 3.4.3 of EN 1995-1-2 to determine the charring depth according to time requirements, considering clause 4.2.2 (Residual cross section method) of EN 1995-1-2. The fire exposed lamella shall be considered as a protective cladding of the subsequent lamella. Analogously, this procedure also applies to walls and floors/roofs made with cross laminated timber.

HASSLACHER CROSS LAMINATED TIMBER	Annex 2	
Characteristic data of cross laminated timber	of European Technical Assessment ETA-12/0281 of 09.11.2020	



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

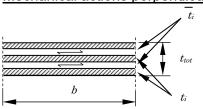
General

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 the 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 2 shall be taken.

Mechanical actions perpendicular to cross laminated timber



Where

ti......Thickness of board layers in direction of mechanical actions

 $\overline{t_i}$Thickness 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 $rac{S_i}{K_i}$ of EN 1995-1-1 should be substituted by $rac{\overline{t_i}}{G_{9090} \cdot b}$.

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

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

$$A_i = b \cdot t_i$$

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

$$h_{tot} = \sum_{i} (t_i + \bar{t_i})$$

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

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

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); $G_{9090} = 50$ MPa

b...... width of the member of cross laminated timber

HASSLACHER CROSS LAMINATED TIMBER

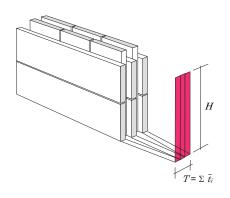
Annex 3

Design considerations for cross laminated timber

of European Technical Assessment ETA-12/0281 of 09.11.2020



Mechanical actions in plane of the solid wood slab



Where

 $H \le 400 \text{ mm}$

t_i....... Thickness of board layers in direction of mechanical actions

 $\overline{t_i}$ 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 stress

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

Section modulus

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

$$A_{x, net} = H \cdot \sum_{i} \overline{t_i}$$

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

HASSLACHER CR	OSS I AMINATE	D TIMBER
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Annex 3

Design considerations for cross laminated timber

of European Technical Assessment ETA-12/0281 of 09.11.2020



EAD 130005-00-0304, European Assessment Document for "Solid wood slab element to be used as a structural element in buildings".

EN 301 (11.2017), Adhesives, phenolic and aminoplastic, for load-bearing timber structures – Classification and performance requirements

EN 338 (04.2016), Structural timber – Strength classes

EN 1995-1-1 (11.2004), +AC (06.2006), +A1 (06.2008), +A2 (05.2014), Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings

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HASSLACHER CROSS LAMINATED TIMBER	Annex 4	
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