ITeC The Catalonia Institute of Construction Technology

Wellington 19
ES-08018 Barcelona
Tel. +34 93 309 34 04
qualprod@itec.cat
www.itec.cat

Member of EOTA
www.eota.eu

European Technical Assessment

ETA 11/0464 of 05.02.2024

General part

Trade name of the construction product	**EGO_CLT™**
Product family to which the construction product belongs	Solid wood slab element to be used as a structural element in buildings.
Manufacturer	**EGOIN SA** Astei ES48287 Natxitua-Ea (Bizkaia) Spain
Manufacturing plant(s)	Astei ES48287 Natxitua-Ea (Bizkaia) Spain Padurea 2 ES01170 Legutio (Araba) Spain
This European Technical Assessment contains	18 pages including 4 annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	European Assessment Document (EAD) 130005-00-0304. *Solid wood slab element to be used as a structural element in buildings.* Edition March 2015.
This version replaces	ETA 11/0464, issued on 20.04.2017

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Specific parts of the European Technical Assessment

1 Technical description of the product

1.1 General

EGO_CLT™ is a panel made of softwood boards which are bonded together in order to form cross laminated timber (solid wood slab element). Adjacent layers are arranged perpendicularly (angle of 90º) to each other, see annex A. Cross-sections of the solid wood slabs are symmetric.

The lay up of cross laminated timber is shown in annex A. Dimensions and specifications are shown in annex B. Surfaces are planed.

A layer of European Larch can be glued to the surface of EGO_CLT™ during the manufacturing process. This layer is not considered in the structural calculations.

The adhesive used for the surface bonding between layers, for the bonding of adjacent boards and for the finger joints is according to EN 15425.

The application of chemical substances (wood preservatives and flame retardant agents) is not subject to this European Technical Assessment.

1.2 Wood

Wood species and strength classes used in the boards of EGO_CLT™ are *Picea Abies* C24 or *Pinus Radiata* C24. European Larch (*Larix decidua* Mill.) can be used as the covering layer of EGO_CLT™.

2 Specification of the intended use(s) in accordance with the applicable EAD

2.1 Intended use

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

The solid wood slab is subject 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 1995-1-1. 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 Working life

The provisions made in this ETA are based on a working life of the EGO_CLT™ solid wood slab elements of 50 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee given by the manufacturer, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

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

Performance of EGO_CLT™ related to the basic requirements for construction works (hereinafter BWR) were determined according to EAD 130005-00-0304 (March 2015). Essential characteristics for the EGO_CLT™ are indicated in table 1.

Basic requirement	Essential characteristic	Performance	
BWR 1	Bending[1)]	See clause B.2, and B.3 in annex B	
	Tension and compression[1)]		
	Shear[1)]		
	Embedment strength	See clause B.4 in annex B	
	Creep and duration of the load		
	Dimensional stability		
	In-service environment		
	Bond integrity		
BWR 2	Reaction to fire	EGO_CLT™	D-s2,d0
		EGO_CLT™ 60 mm thick with a covering layer 10 mm thick of European Larch	C-s1,d0
	Resistance to fire	See annex D	
BWR 3	Content, emission and/or release of dangerous substances	No dangerous substances contained	
	Water vapour permeability – water vapour transmission	50 (dry) to 20 (wet)	
BWR 4	Impact resistance	Soft body resistance is assumed to be fulfilled for walls with a minimum of 3 layers and minimum thickness of 60 mm	
BWR 5	Airborne sound insulation	See clause B.5.1.1 in annex B	
	Impact sound insulation	See clause B.5.2.1 in annex B	
	Sound absorption	Not assessed	
BWR 6	Thermal conductivity	0,13 W/(m·K)	
	Air permeability	Class 4 according to EN 12207	
	Thermal inertia	1.600 J/(kg·K)	

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

Table 1: Performance of EGO_CLT™.

3.1 Essential characteristics of the product

3.1.1 General

The EGO_CLT™ corresponds to the specifications given in table 1 and annex B.

3.2 Assessment methods

3.2.1 General

The assessment of EGO_CLT™ for the intended use considering the basic requirements for construction works 1, 2, 3, 4, 5 and 6 of Regulation (EU) Nº 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.*

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

For the assessment and verification of constancy of performance the following systems (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) apply to the solid wood slab element:

System 1 for any intended uses.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC[1] and the factory production control shall be in accordance with it (the Control Plan specifies the type and frequency of checks/tests conducted during production and on the final product).

Products not manufactured by the kit manufacturer shall also be controlled according to the Control Plan.

Where materials/components are not manufactured and tested by the supplier in accordance with agreed methods, then they shall be subject to suitable checks/tests by the kit manufacturer before acceptance.

Any change in the manufacturing procedure which may affect the properties of the product shall be notified and the necessary type-testing revised according to the *Control Plan.*

Issued in Barcelona on 5 February 2024

by the Catalonia Institute of Construction Technology.

Ferran Bermejo Nualart

Technical Director, ITeC

[1] The *Control Plan* is a confidential part of the ETA and only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

ANNEX A: Description of EGO_CLT™

Principal structure of a solid wood slab with 3 layers

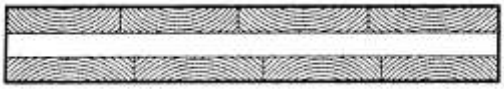

Figure A1.1: Principal structure of a solid wood slab with 3 layers.

Principal structure of a solid wood slab with 5 layers

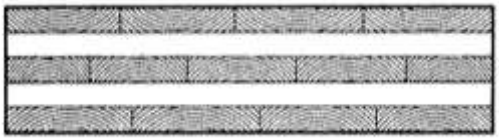

Figure A1.2: Principal structure of a solid wood slab with 5 layers.

Principal structure of a solid wood slab with 7 layers

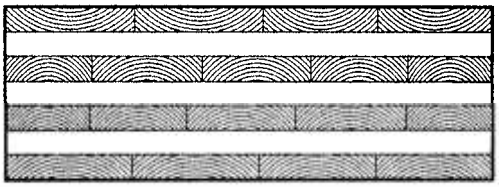

Figure A1.3: Principal structure of a solid wood slab with 7 layers.

Generic structure of the solid wood slab (example with 7 layers)

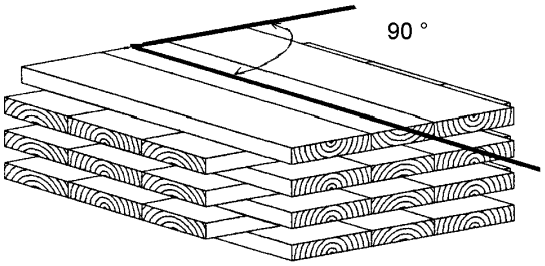

Figure A1.4: Generic structure of the solid wood slab (example with 7 layers).

ANNEX B: Dimensions, specifications and characteristic data of EGO_CLT™

B.1. Dimensions and specifications

Characteristic	Dimension / Specification		
Boards			
Surface	Planed with 0,5 mm of tolerance		
Material and strength class according to EN 338	*Pinus Radiata* (C24)	*Picea Abies* (C24)	--
	Machine graded	Graded and certified by supplier	
Minimum mean density	550	420	kg/m^3
Length	≤ 6.000 without finger joints ≤ 17.500 with finger joints		mm
Width	100; 140; 170; 200		mm
Thickness	20; 25; 30; 40		mm
Ratio width to thickness	≥ 4:1		--
Moisture of wood according to EN 13183-2	Between 10 and 14		%
Finger joints	EN 385		--
Elements			
Length	≤ 17.500		mm
Width	≤ 3.800		mm
Thickness	Between 60 and 380		mm
Numbers of layers	Between 3 and 9 [1)]		--
Number of consecutive layers having the same direction	1 or 2		--
Moisture	Between 10 and 16		%

[1)] Panels of 9 layers have consecutive layers with the same direction.

Table B.1: Dimensions and specifications of EGO_CLT™.

B.2. Load bearing capacity and stiffness regarding mechanical actions perpendicular to the solid wood slab

Property	Verification method	Performance
Strength class of boards	EN 338	C24
Modulus of elasticity		
- parallel to the grain of the boards $E_{0,mean}$	I_{ef}	
	Annex C of ETA	11.600 MPa
	Clause 2.2.1.1 of EAD 130005-00-0304	
- perpendicular to the grain of the boards $E_{90,mean}$	EN 338	370 MPa
Shear modulus		
- parallel to the grain of the cover boards G_{mean}	EN 338	690 MPa
- perpendicular to the grain of the cover boards (rolling shear modulus) $G_{R,mean}$	Clause 2.2.1.3 of EAD 130005-00-0304	50 MPa
Bending strength		
- parallel to the grain of the boards $f_{m,k}$	W_{ef}	
	Annex C of ETA	24 MPa
	Clause 2.2.1.1 of EAD 130005-00-0304	
Tensile strength		
- perpendicular to the grain of the boards $f_{t,90,k}$	EN 338	0,4 MPa
Compressive strength		
- perpendicular to the grain of the boards $f_{c,90,k}$	EN 338 (boards of *Picea Abies*)	2,50 MPa
	Testing acc. to EN 408 (boards of *Pinus Radiata)*	3,15 MPa
Shear strength		
- parallel to the grain of the cover boards $f_{v,k}$	EN 338	4,0 MPa
- perpendicular to the grain of the cover boards (rolling shear strength) $f_{R,v,k}$	A_{gross}	
	Annex C of ETA	0,65 MPa
	Clause 2.2.1.3 of EAD 130005-00-0304	

Table B.2: Mechanical capacities with actions perpendicular to the solid wood slab EGO_CLT™.

B.3. Load bearing capacity and stiffness regarding mechanical actions in plane of the solid wood slab

Property	Verification method	Performance
Strength class of boards	EN 338	C24
Modulus of elasticity		
- parallel to the grain of the cover boards $E_{0,mean}$	A_{net}	
	Annex C of ETA	11.600 MPa
	Clause 2.2.1.1 of EAD 130005-00-0304	
Bending strength		
- parallel to the grain of the boards $f_{m,k}$	A_{net}	
	Annex C of ETA	24 MPa
	Clause 2.2.1.1 of EAD 130005-00-0304	
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 $f_{v,0,k}$	A_{net}	
	Annex C of ETA	5,0 MPa
	Clause 2.2.1.3 of EAD 130005-00-0304	

Table B.3: Mechanical capacities with actions in plane of the solid wood slab EGO_CLT™.

B.4. Other mechanical actions

<table>
<tr><th>Property</th><th>Verification method</th><th colspan="6">Reference value</th></tr>
<tr><td>Embedment strength</td><td>EN 1995-1-1</td><td colspan="6">Joint design and embedding strength values given in EN 1995-1-1 for solid timber shall be used.</td></tr>
<tr><td rowspan="8">Creep and duration of load</td><td rowspan="8">EN 1995-1-1</td><td colspan="6">k_{def} (creep)</td></tr>
<tr><td></td><td colspan="2">Actions perpendicular to the slab (1)</td><td colspan="3">Actions in plane of the slab (2)</td></tr>
<tr><td>Service class 1</td><td colspan="2">0,80</td><td colspan="3">0,60</td></tr>
<tr><td>Service class 2</td><td colspan="2">1,00</td><td colspan="3">0,80</td></tr>
<tr><td colspan="6">k_{mod} (duration of load)</td></tr>
<tr><td colspan="6">Actions perpendicular and in plane of the slab (3)</td></tr>
<tr><td></td><td>Permanent</td><td>Long term</td><td>Medium term</td><td>Short term</td><td>Instantaneous</td></tr>
<tr><td>Service class 1</td><td>0,60</td><td>0,70</td><td>0,80</td><td>0,90</td><td>1,10</td></tr>
<tr><td>Service class 2</td><td>0,60</td><td>0,70</td><td>0,80</td><td>0,90</td><td>1,10</td></tr>
<tr><td colspan="7">(1) In case of actions perpendicular to the slab, the creep of EGO_CLT™ corresponds to the creep of plywood.
(2) In case of actions in plane of the slab, the creep of EGO_CLT™ corresponds to the creep of solid wood.
(3) In case of actions perpendicular and in plane of the slab, the duration of load of EGO_CLT™ corresponds to the duration of load of solid wood.</td></tr>
<tr><td rowspan="6">Dimensional stability</td><td colspan="6">• Tolerances of dimensions:</td></tr>
<tr><td>Manufacturer’s declaration</td><td colspan="5">Tolerances of dimensions in standard ambient conditions (20 ± 2 ºC temperature, 65 ± 5 % relative humidity) are as follows:
• Thickness (h): ± 1 mm for solid wood slabs from 60 mm till 125 mm of thickness.
± 2 mm for solid wood slabs over 125 mm till 225 mm of thickness.
± 3 mm for solid wood slabs over 225 mm till 380 mm of thickness.
• Length (l): ± 2 mm.
• Width (b): ± 2 mm.</td></tr>
<tr><td colspan="6">• Stability of dimensions:</td></tr>
<tr><td>Manufacturer’s declaration</td><td colspan="5">Moisture content of the solid wood slab varies between 10 and 16 %. However, during manufacturing, the moisture content between the boards within one slab has to be less than 4 %.
Due to changing temperature and relative humidity of the surrounding air the moisture content of the solid wood slab will continuously change.
The stability of dimensions are:
• Longitudinal to the grain direction: 1,2%.
• Radial to the grain direction: 0,3%.
• Perpendicular to the grain direction: 0,0005 %.</td></tr>
<tr><td colspan="6">• Thermal expansion:</td></tr>
</table>

Property	Verification method	Reference value				
	EN 1991-1-5	Linear expansion coefficient parallel to the grain (α_T [x10^{-6}/ºC]):				5
In-service environment	Durability of timber					
	EN 350-1 EN 350-2 EN 335		Fungus attack	Hylotrupes attack	Anobium attack	Termites attack
		Pinus Radiata	4-5	S	SH	S
		Picea Abies	4	SH	SH	S
	Service classes					
	EN 1995-1-1 clause 2.3.1.3	Service classes 1 and 2				
Bond integrity	EAD 130005-00-0304	Pass				

Table B.4: Other mechanical actions on the solid wood slab EGO_CLT™.

B.5. Acoustical performances

B.5.1 Airborne sound insulation

B.5.1.1 Tests on solid wood slabs

Configuration	Performance	
	R_A [dBA]	$R_w(C;C_{tr})$ [dB]
Tests on walls		
Solid wood slab 81 mm thick (3 layers of 27 mm) and 481,5 kg/m^3 of density	31,0	31 (-1;-4)
Tests on floors		
Solid wood slab 135 mm thick (5 layers of 27 mm) and 496,3 kg/m^3 of density	38,0	38 (-1;-4)

Table B.5.1: Airborne sound insulation of solid wood slabs.

B.5.1.2 Tests on systems with solid wood slabs

The following data are informative and have been obtained according to test methods of EAD 130005-00-0304. The components of the systems additional to the solid wood slab are not part of the ETA. The identification of such components is made through their basic characteristics. The performances of these systems are not be incorporated in the DoP.

Configuration	Performance	
	R_A [dBA]	$R_w(C;C_{tr})$ [dB]
Tests on walls		
(Inside) Solid wood slab 81 mm thick (3 layers of 27 mm) and 481,5 kg/m^3 of density + Mineral wool 25 mm thick and 155 kg/m^3 of density + Air cavity 15 mm thick + Solid wood slab 81 mm thick (3 layers of 27 mm) of 481,5 kg/m^3 of density fully supported on rubber strips 8 mm thick. (Outside)	47,2	48 (-2;-7)

Configuration	Performance	
	R_A [dBA]	$R_w(C;C_{tr})$ [dB]
(Inside) Gypsum plasterboard 12,5 mm thick and 8,4 kg/m^2 of mass surface + Mineral wool 50 mm thick and 35 kg/m^3 of density + Air cavity 10 mm thick + Solid wood slab 81 mm thick (3 layers of 27 mm) and 481,5 kg/m^3 of density + Mineral wool 25 mm thick and 155 kg/m^3 of density + Air cavity 15 mm thick + Solid wood slab 81 mm thick (3 layers of 27 mm) and 481,5 kg/m^3 of density fully supported on rubber strips 8 mm thick. (Outside)	56,8	61 (-5;-13)
(Inside) Gypsum plasterboard 12,5 mm thick and 8,4 kg/m^2 of mass surface + Mineral wool 50 mm thick and 35 kg/m^3 of density + Air cavity 10 mm thick + Solid wood slab 81 mm thick (3 layers of 27 mm) of 481,5 kg/m^3 of density + Gypsum plasterboard 12,5 mm thick and 8,4 kg/m^2 of mass surface (Outside)	49,7	53 (-4;-12)
(Inside) Gypsum plasterboard 12,5 mm thick and 8,4 kg/m^2 of mass surface + Mineral wool 50 mm thick and 35 kg/m^3 of density + Air cavity 10 mm thick + Solid wood slab 81 mm thick (3 layers of 27 mm) of 481,5 kg/m^3 of density + Façade cladding (waterproofing membrane + mineral wool 140 mm thick and 150 kg/m^3 of density + two wood planks, 28 mm and 22 mm thick) (Outside)	51,5 44,2 ($R_{A,tr}$)	53 (-3;-9)
Tests on floors		
(Top side) Floating floor (gypsum board reinforced with fibrous 15 mm thick and 17,5 kg/m^2, and wood wool panel 7 mm thick and 275 kg/m^3) + Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density (Bottom side)	46,0	47 (-2;-7)

Configuration	Performance	
	R_A [dBA]	$R_w(C;C_{tr})$ [dB]
(Top side) Floating floor (gypsum board reinforced with fibrous 15 mm thick and 17,5 kg/m^2 + wood wool panel 7 mm thick and 275 kg/m^3) + Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density + Ceiling (profiles + mineral wool 100 mm thick and 75 kg/m^3 + air cavity 20 mm + 2 gypsum plasterboards 12,5 mm thick and 8,4 kg/m^2 each) (Bottom side)	59,9	64 (-5;-12)
(Top side) Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density + Ceiling (profiles + mineral wool 100 mm thick and 75 kg/m^3 + air cavity 20 mm + 2 gypsum plasterboards 12,5 mm thick and 8,4 kg/m^2 each) (Bottom side)	60,3	61 (-2;-7)
(Top side) Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density + Ceiling (profiles + mineral wool 100 mm thick and 75 kg/m^3 + air cavity 20 mm + 1 gypsum plasterboards 12,5 mm thick and 8,4 kg/m^2) (Bottom side)	59,3	61 (-3;-9)

Table B.5.2: Airborne sound insulation of systems with solid wood slabs.

B.5.2 Impact sound insulation

B.5.2.1 Tests on solid wood slabs

Configuration	Performance
Tests on floors	**$L_{n,w}(C_I)$ [dB]**
Solid wood slab 135 mm thick (5 layers of 27 mm). Density: 496,3 kg/m^3	89 (-6)

Table B.5.3: Impact sound insulation of solid wood slabs.

B.5.2.2 Tests on systems with solid wood slabs

The following data are informative and have been obtained by using the test methods of EAD 130005-00-0304. The components of the systems additional to the solid wood slab are not part of the ETA. The identification of such components is made through their basic characteristics. The performance of these systems are not be incorporated in the DoP.

Configuration	Performance
	$L_{n,w}(C_I)$ [dB]
Tests on floors	
(Top side) Floating floor (gypsum board reinforced with fibrous 15 mm thick and 17,5 kg/m^2, and wood wool panel 7 mm thick and 275 kg/m^3) + Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density (Bottom side)	74 (0)
(Top side) Floating floor (gypsum board reinforced with fibrous 15 mm thick and 17,5 kg/m^2 + wood wool panel 7 mm thick and 275 kg/m^3) + Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density + Ceiling (profiles + mineral wool 100 mm thick and 75 kg/m^3 + air cavity 20 mm + 2 gypsum plasterboards 12,5 mm thick and 8,4 kg/m^2 each) (Bottom side)	52 (1)
(Top side) Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density + Ceiling (profiles + mineral wool 100 mm thick and 75 kg/m^3 + air cavity 20 mm + 2 gypsum plasterboards 12,5 mm thick and 8,4 kg/m^2 each) (Bottom side)	62 (-3)
(Top side) Solid wood slab 135 mm thick (5 layers of 27 mm) of 496,3 kg/m^3 of density + Ceiling (profiles + mineral wool 100 mm thick and 75 kg/m^3 + air cavity 20 mm + 1 gypsum plasterboards 12,5 mm thick and 8,4 kg/m^2) (Bottom side)	62 (-2)

Table B.5.4: Impact sound insulation.

ANNEX C: Design considerations for EGO_CLT™ solid wood slab

C.1. Actions perpendicular to the solid wood slab

Stress distribution within the solid wood slab shall be calculated taking into account the rolling shear deformation of the cross layers.

For simply supported solid wood slabs with up to 5 layers the stress distribution may be calculated applying EN 1995-1-1 Annex B, *Mechanically jointed beams*, where the deformation between the parts due to yield of the fasteners is replaced by the shear deformation of the cross layers.

Characteristic strength and stiffness values to be used are given in clause B.2 of Annex B. Thus, with the symbols as defined in Figure C.1, the following equations apply:

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

$$\gamma_1 = \left(1 + \frac{\pi^2 E A_1 \cdot d_{12}}{\ell^2 \; G \cdot b} \right)^{-1} \qquad \gamma_2 = 1 \qquad \gamma_3 = \left(1 + \frac{\pi^2 E A_3 \cdot d_{23}}{\ell^2 \; G \cdot b} \right)^{-1}$$

$$a_1 = \left(\frac{d_1}{2} + d_{12} + \frac{d_2}{2}\right) - a_2 \qquad a_3 = \left(\frac{d_2}{2} + d_{23} + \frac{d_3}{2}\right) + a_2$$

$$a_2 = \frac{\gamma_1 A_1 \cdot \left(\frac{d_1}{2} + d_{12} + \frac{d_2}{2}\right) - \gamma_3 A_3 \cdot \left(\frac{d_2}{2} + d_{23} + \frac{d_3}{2}\right)}{\gamma_1 A_1 + \gamma_2 A_2 + \gamma_3 A_3}$$

$$\sigma_{r,j} = \pm \frac{M}{I_{ef}} \cdot \left(\gamma_j a_j + \frac{d_j}{2} \right) \qquad \tau_{max} = \frac{V \gamma_j S_j}{I_{ef} \cdot b}$$

The symbol G in the equations above refers to $G_{R,mean}$ of clause B.2 of Annex B.

A_1, A_2, and A_3 are the cross-sectional areas of the layers whose grain direction is parallel to the span.

For symmetrical lay up, $a_2=0$ and $\gamma_1=\gamma_3$.

For 3 layers, $d_2=0$, $d_{12}=d_{23}=d/2$ (half the thickness of the cross layer in the middle of the slab).

For the bending design only the stresses at the edges of the boards are decisive; axial stresses in the center of the boards need not to be considered in the design.

The characteristic bending strength properties from clause B.2 of ETA may be multiplied by a system strength factor:

$$k_l = \min \begin{cases} 1+0{,}025 \cdot n; & n = \text{number of boards along the width of the element.} \\ 1{,}2 \end{cases}$$

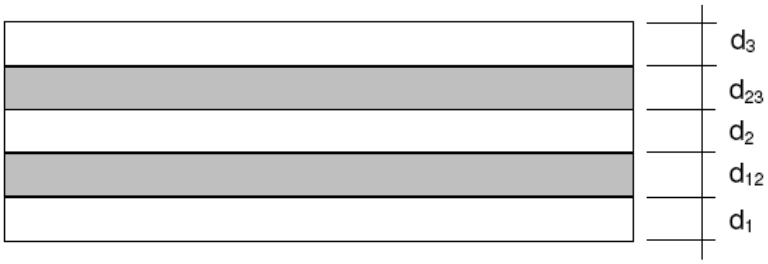

Figure C.1: Symbols used in the calculations.

Effective layers in bending are d_1, d_2 and d_3. Rolling shear layers are d_{12} and d_{23}.

For 7 layers, the same methodology based on the same principles shall be used.

C.2. Actions in the plane of the solid wood slab

Stress distribution within the solid wood slab has to be calculated by taking into account only the boards whose grain is oriented in the direction of the actions.

For the design of solid wood slabs the characteristic strength and stiffness values according to clause B.3 of annex B of ETA shall be used.

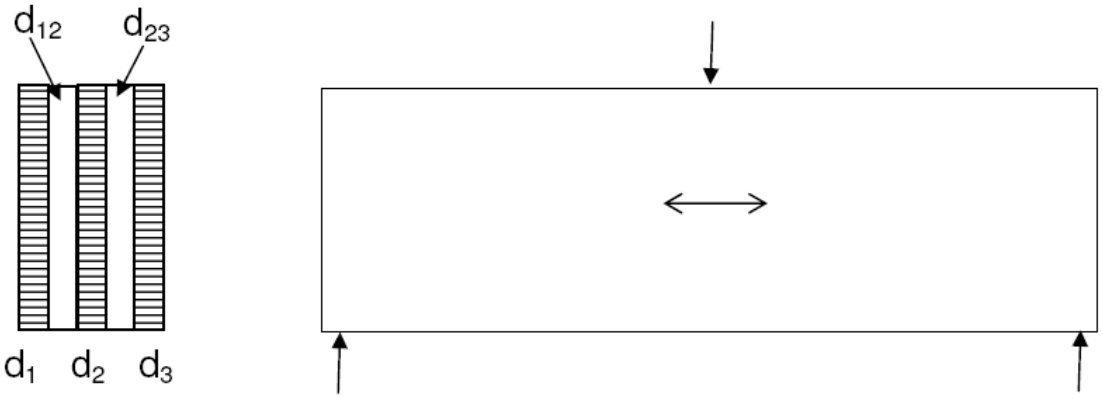

Figure C.2: Symbols used in the calculations.

Effective layers are either d_1, d_2 and d_3 or d_{12} and d_{23}, depending on the grain direction of the layers. The slab in figure C.2 is submitted to bending and the grain direction of the layers d_1, d_2 and d_3, shown by an arrow in the figure, is oriented in direction of the span, thus the layers d_1, d_2 and d_3 are effective.

ANNEX D: Charring rates of EGO_CLT™ solid wood slab

D.1. Charring rates

The simplified bilinear model adopted by EN 1995-1-2 for initially protected surfaces can be used. It has to be considered that the fire protective charcoal falls off after each layer is completely charred, which is the expected behaviour when PU adhesives are used.

The charring rates (β_0) shown in table D.1 can be used for design purposes of structural elements based on EGO_CLT™ panels, taking into account the following factors:

- The intended use of the panel: wall or floor/roof
- The position of the board in the panel: fire exposed board or further boards in the panel

Intended use	Position of the board in the panel	Board depth [mm]	Charring rate (β_0) [mm/min]
Wall	Fire-exposed board	The first 25 mm of board show a charring rate of:	0,65
		From 25 mm on (1) the charring rate of this board is:	0,70
	Further boards (2)	The first 25 mm of board show a charring rate of:	0,90
		From 25 mm on (1) the charring rate of this board is:	0,70
Floor or roof	Fire-exposed board	The first 25 mm of board show a charring rate of:	0,65
		From 25 mm on (1) the charring rate of this board is:	0,80
	Further boards (2)	The first 25 mm of board show a charring rate of:	1,30
		From 25 mm on (1) the charring rate of this board is:	0,80

Notes:

(1) A charcoal layer is formed.

(2) Since the fire protective charcoal falls off after each layer is completely charred, the criteria to analyse subsequent boards (3rd, 4th, etc.) is the same as the criteria used to analyse the 2nd board.

Table D.1: Charring rates of EGO_CLT™ according to the position of the board.