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Authorized and notified according
to Article 29 of the Regulation (EU)
No 305/2011 of the European
Parliament and of the Council of 9
March 2011

MEMBER OF EOTA



European Technical Assessment ETA-24/1202 of 2025/01/15

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

Arboreal CLT

Product family to which the above construction product belongs:

Cross laminated timber element

Manufacturer:

Arboreal SA
Ruta 26 km 224 – Paraje Paso Santander
Tacuarembó, 45000
Uruguay
Internet www.arboreal.com

Manufacturing plant:

Arboreal SA
Ruta 26 km 224 – Paraje Paso Santander
Tacuarembó, 45000
Uruguay

This European Technical Assessment contains:

11 pages including 2 annexes which form an integral part of the document

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

EAD 130005-00-0304 - Solid wood slab element for use as structural element in buildings

This version replaces:

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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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Arboreal CLT is a cross laminated timber element made of softwood made from approx. 90% Loblolly Pine (*Pinus taeda*) and approx. 10 % Slash Pine (*Pinus elliotti*) consisting of 3, 5 or 7 layers. The lay-up of the cross laminated timber shall be approximately symmetrical to its centre plane. A layup is considered symmetrical, if the distance between the centre of gravity of the element cross-section and the centre plane does not exceed 3% of the thickness of the cross laminated timber element.

The components and the system setup of the product are given in Annex 1.

The application of chemical substances (wood preservatives and flame retardants) is not subject of the European technical assessment.

Wood species are Loblolly Pine (*Pinus Taeda*) and Slash Pine (*Pinus Elliotti*). Dimensions and specifications are given in annex 2.

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

The cross laminated timber is intended to be used as a structural or non-structural element in buildings and timber structures. The cross laminated timber shall be subjected to static and quasi static actions only. This includes seismic actions according to EN 1998-1.

The cross laminated timber 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 cross laminated timber element in service.

The performances given in Section 3 are only valid if the cross laminated timber elements are used in compliance with the specifications and conditions given in Annex 1 to 4.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the wood slab elements of 50 years.

The real working life may be, in normal conditions, considerably longer without major degradation affecting the essential requirements of the works.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, 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.

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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR1)¹⁾	
Bending ²⁾	Annex 3
Tension and compression ²⁾	Annex 3
Shear ²⁾	Annex 3
Embedment strength	Annex 3
Creep and duration of the load	Annex 3
Dimensional stability	Annex 3
In-service environment	Annex 3
Bond integrity	Annex 3
3.2 Safety in case of fire (BWR2)	
Reaction to fire	Euroclass D-s2,d0 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364 Euroclass D _{fl} -s1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
Resistance to fire	
Charring rate	No performance assessed
3.3 Hygiene, health and the environment (BWR3)	
Content, emission and/or release of dangerous substances	No performance assessed
Water vapour permeability – Water vapour transmission	No performance assessed
3.4 Safety in use (BWR4)	
Impact resistance	Soft body resistance is assumed to be fulfilled for walls with a minimum of 3 layers and minimum thickness of 88 mm.
3.5 Protection against noise (BWR5)	No performance assessed
3.6 Energy economy and heat retention (BWR6)	No performance assessed

¹⁾ This characteristic also relates to BWR 4

²⁾ Load bearing capacity and stiffness regarding mechanical actions perpendicular to and in plane of the cross laminated timber element.

3.7 Mechanical resistance and stability

For gluing the layers among each other to form a cross laminated timber element as well as the finger joints of the individual boards an adhesive type I according to EN 15425 is to be used. Specifications are deposited with ETA Danmark A/S.

3.8 Aspects related to the performance of the product

The cross laminated timber elements are manufactured in accordance with the provisions of this European Technical Assessment using the automated manufacturing process in accordance with the technical documentation.

The layers shall be bonded together to the required thickness of the cross laminated timber.

Specifications of the used boards are given in Annex 2. Boards are visually or machine strength graded. Only technically dried wood shall be used.

The boards may be connected by finger joints in longitudinal direction according to EN 14080. There shall be no butt joints.

The cross laminated timber elements correspond to the specifications given in Annexes 1 to 3 of this European technical assessment. The material characteristics, dimensions and tolerances of the cross laminated timber elements not indicated in these Annexes are given in the technical documentation of the European Technical Assessment.

Design

The European Technical Assessment only applies to the manufacture and use of cross laminated timber elements. Verification of stability of the building while using the cross laminated timber elements is not subject of the European Technical Assessment.

The following conditions shall be observed:

- Design of the cross laminated timber elements 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 elements.
- The cross laminated timber elements are installed correctly.

Design of the cross laminated timber element can be performed according to EN 1995-1-1 and EN 1998-1, taking into account Annexes 2 to 5 of the European

Technical Assessment. Standards and regulations valid in the place of use shall be considered.

Execution of construction works

The cross laminated timber elements shall be protected during transport and storage against any damage and detrimental moisture effects. The manufacturer's instructions for packaging transport and storage shall be observed.

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 cross laminated timber element immediate actions regarding the mechanical resistance and stability of the works shall be initiated. Should this situation arise replacement of the elements can be necessary.

The manufacturer shall prepare assembling instructions in which the product-specific characteristics and important measures to be taken into consideration for assembling are described. The assembling instructions shall be available at every construction site.

The assembling of the cross laminated timber elements according to this European technical assessment shall be carried out by appropriately qualified personnel.

Cross laminated timber elements shall be protected against detrimental change of moisture. The safety-at-work and health protection regulations have to be observed.

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

4.1 AVCP system

According to the Decision 97/176/EC of the European Commission, as amended by 2001/596/EC, the system of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011) is System 1.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2025-01-15 by



Thomas Bruun
Managing Director, ETA-Danmark

Annex 1
Construction of the wood slab elements Arboreal CLT (example)

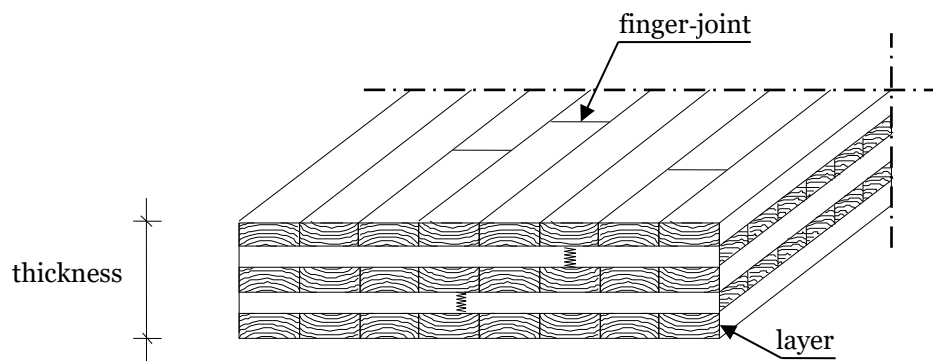


Figure 1: Principle structure of the cross laminated timber (five layers)

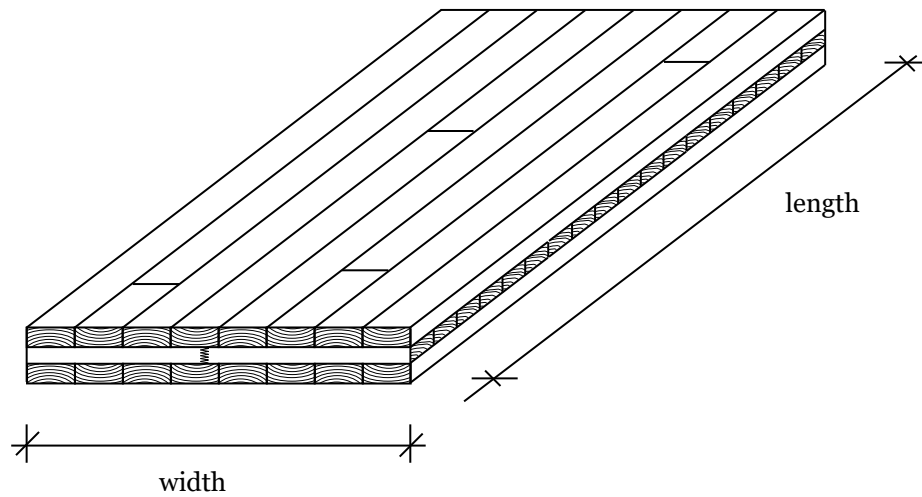


Figure 2: Cross laminated timber element (three layers)

Annex 2
Dimensions and specifications of the cross laminated timber

Characteristic	Dimensions and specifications				
Cross laminated timber element					
Thickness	88 to 350 mm				
Tolerance in thickness	± 1 mm				
Width	1,8 m to 3,50 m				
Tolerance in width	± 2 mm				
Length	6 m to 12 m				
Tolerance in length	± 6 mm				
Number of layers	3, 5 and 7				
Maximum number of adjacent fiber paralleled bonded layers	2				
Maximum width of gaps between adjacent boards in longitudinal or cross layers	2 mm				
Ply lay up	Symmetrical				
Adhesive system	IC-PUR type EN 15425 I 90 GP 0,3 w adhesive				
Boards					
Material	approx. 90% Loblolly Pine (Pinus teeda) and approx. 10 % Slash Pine (Pinus Elliotti)				
Strength class according to EN 338					
Face layers	C14	C22	C22	C24	C24
Core layers	C14	C22	C14	C14	C22
Thickness t	22 to 45 mm				
Width b	140 to 200 mm				
Ratio width b to thickness t of non-edge glued cross-layers	$b/t \geq 4:1$				
Moisture of wood according to EN 13183-2	9% to 14,5% Within one cross laminated timber element the moisture content difference between single boards is limited to 5%				
Finger joints	According to EN 16351 (profile 15/8308)				
Adhesive system	IC-PUR type EN 15425 I 90 GP 0,3 w adhesive				

Annex 3

Design principles of the cross laminated timber elements

Table 2: Essential Requirements of the cross laminated timber

ER	Requirement	Verification method	Class / Use category / value
1	Mechanical resistance and stability		
	For the calculation the characteristic strength and stiffness values of softwood according to EN 338 shall be used taking into consideration the definitions in annex 2.		
	For the design of the solid wood slabs according to EN 1995-1-1 a bending strength (maximum stress in the outermost fibre) according to the bending strength of the boards (24 N/mm ² for C24 and 14 N/mm ² for C14) may be assumed. Additionally, the factor k_{sys} according to EN 1995-1-1, Figure 6.12 may be taken into account depending on the number of layers parallel to the span.		
	For the design of the solid wood slabs according to EN 1995-1-1 the shear strengths $f_{v,gross,k} = 3,0$, $f_{v,net,k} = 8,0$ N/mm ² , $f_{v,tor,k} = 2,5$ N/mm ² and a shear modulus of 650 N/mm ² may be assumed. In addition, the following values apply:		
	Board strength class	EN 338	C14 C22 C24
	Modulus of elasticity parallel to grain of the boards $E_{0,mean}$	EAD 130005-00-0304 2.2.1.1	C14 8000 MPa C22 11000 MPa C24 11500 MPa
	Bending strength parallel to grain of the boards $f_{m,k}$	EAD 130005-00-0304 2.2.1.1	C14 $k_{sys} \cdot 14$ MPa C22 $k_{sys} \cdot 22$ MPa C24/ $k_{sys} \cdot 24$ MPa
	Density ρ_k	EAD 130005-00-0304	C14 1,1 · 350 kg/m ³ C22 1,1 · 360 kg/m ³ C24 1,1 · 380 kg/m ³
	1.1 Mechanical actions in plane of the cross laminated timber		
	Shear strength for the calculation with the gross cross section $f_{v,gross,k}$	EAD 130005-00-0304 2.2.1.3	3,0 MPa
	Shear strength for the calculation in the joints between non-edge glued boards within a layer $f_{v,net,k}$	EAD 130005-00-0304 2.2.1.3	8,0 MPa
	Shear strength for the calculation in the crossing areas of orthogonally bonded non-edge glued boards $f_{v,tor,k}$	EAD 130005-00-0304 2.2.1.3	2,5 MPa
	1.2 Mechanical actions perpendicular to the plane of the cross laminated timber		
	Rolling shear strength $f_{R,k}$	EAD 130005-00-0304 2.2.1.3	1,7 MPa
	Rolling shear modulus $G_{90,mean}$	EAD 130005-00-0304 2.2.1.3	50 MPa
	Compression strength $f_{c,90,k}$	EAD 130005-00-0304	3,0 MPa
* A centre layer consisting of C14 or C22 boards maybe assumed to be made up of C24 boards. For references regarding the calculation see below. National regulations might have to be followed.			
Use of fasteners	According to EN 1995-1-1, for further details see annex 4		
Creep and duration of load	According to EN 1995-1-1		
Dimensional stability	Moisture content during use shall not change to such extent that adverse deformations can occur.		

1.1 Mechanical actions in plane of the cross laminated timber

Stress distribution within the element has to be calculated by taking into account only the boards which are oriented in the direction of the actions.

Shear stresses may be calculated with the total width of the cross laminated timber and must not exceed $f_{v,d}$, where $f_{v,k}$ is defined as:

$$f_{v,k} = \min \left\{ f_{v,gross,k}; f_{v,net,k} \cdot \frac{t_{net}}{t_{tot}}; f_{v,tor,k} \cdot \frac{1}{6 \cdot t_{tot}} \cdot \sum_{i=1}^{n-1} \frac{b_i^2 + b_{i+1}^2}{a_i} \right\}$$

with t_{net} = lower accumulated thickness of longitudinal or cross layers, respectively.

t_{tot} = thickness of cross laminated timber element, or accumulated thickness of longitudinal and cross layers.

n = number of board layers within cross laminated timber element. Adjacent parallel layers are considered as one layer.

b_i = board width in layer i

b_{i+1} = board width in layer $i + 1$

a_i = $\max \{b_i; b_{i+1}\}$

For the design of cross laminated timber elements made of layers of softwood the characteristic strength and stiffness values of the layers of softwood shall be taken from Table 2.

For the verification of the bending strength the design bending strength value of a layer of boards may be multiplied by a system strength factor k_{sys}

$$k_{sys} = \min \left\{ \begin{array}{l} 0,975 + 0,025 \cdot n_{\ell} \\ 1,2 \end{array} \right.$$

with n_{ℓ} = number of longitudinal layers.

1.2 Mechanical actions perpendicular to the plane of the cross laminated timber

Stress distribution within the cross laminated timber has to be calculated taking into account the shear deformation of the cross layers.

For simply supported cross laminated timber elements with up to 5 layers the stress distribution may be calculated according to EN 1995-1-1 as mechanically jointed beam where the value s_i/K_i is substituted by $d_i/(G b)$ with d_i = thickness of the cross layer, G = rolling shear modulus of the cross layer $G_{9090,mean}$ and b = width of the cross layer.

For cross laminated timber with more than 5 layers, numerical solutions offered by computer programs may be used taking into account the shear deformation of the cross layers.

For the design of cross laminated timber, the characteristic strength and stiffness values shall be taken from Table 2.

For the bending design only the stresses at the edges of the boards are decisive, axial stresses in the centre of the boards are not considered in the design.

In bending design, the characteristic bending strength properties may be multiplied by a system strength factor k_{sys}

$$k_{sys} = \min \begin{cases} 0,975 + 0,025 \cdot n_{\ell} \\ 1,2 \end{cases}$$

with n_{ℓ} = number of boards within the outermost longitudinal layer

Tension loads perpendicular to the element should be avoided.