ETA-Danmark A/S
Göteborg Plads 1
DK-2150 Nordhavn
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk

Authorised 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

European Technical Assessment ETA-18/0884 of 2020/07/20

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:	PMC - Panneau Multiplis de Construction
Product family to which the above construction product belongs:	Cross laminated timber element
Manufacturer:	Schilliger Bois SAS Rue du Port Rhénan F-68600 Volgelsheim Telephone +33 (0)3 89 72 16 00 Telefax +33 (0)3 89 72 95 01 Internet www.schilliger.fr
Manufacturing plant:	Schilliger Bois SAS Rue du Port Rhénan F-68600 Volgelsheim
This European Technical Assessment contains:	12 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:	The ETA with the same number issued on 2018-12-03

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

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es) referred to above). However, partial reproduction may be made, with the written consent of the issuing Technical Assessment Body. Any partial reproduction has to be identified as such.

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product
Schilliger PMC cross laminated timber elements are made of solid softwood boards, which are glued together in order to form a slab. The boards of single layers are running turn and turnabout inclined with 90 °. The species used is spruce (Picea abies) or equivalent softwood. The one-component polyurethane adhesive used to bind together the laminations, as well as in the finger joints, corresponds to type I (full exposure to the weather) according to EN 15425.

When delivered, the product does not contain any biocides. When relevant, the products may be treated for better durability e.g. against wood boring insects, or surface treatments may be used for esthetical purposes. This ETA for PMC cross laminated timber only applies for untreated elements and does not cover any effects of surface treatments, timber preservatives or flame retardants.

The maximum thickness of PMC cross laminated timber elements is 0,5 m, maximum width 3,4 m and maximum length 18,0 m. Lamination thickness is between 9 and 50 mm.

Schilliger PMC cross laminated timber elements is a cross laminated timber element made of softwood consisting of an even or odd number of layers with a minimum of 3 layers up to a maximum of 33 layers.

It is possible to organize adjacent board layers oriented parallel to each other, provided the number of parallel board layers does not exceed 3 and the accumulated thickness of parallel board layers does not exceed 90 mm.

The materials, dimensions and tolerances are given in Annex 1.

2 Specification of the intended use in accordance with the applicable EAD

The solid wood slab is intended to be used as a structural or non-structural element in buildings. The solid wood slab shall be subjected to static and quasi static actions only. Local design regulations shall be taken into account in areas where the elements might support seismic action.

Schilliger PMC is made of *Picea abies* and *Abies alba.* Durability against fungi of these species is of class 4 according to EN 350-2. Durability may be reduced by attack from insects such as long horn beetle, dry wood termites and anobium in regions where these may be found.

The solid wood slab is intended to be used in service classes 1 and 2 according to EN 1995-1-1. The product may be exposed to the weather for a short time during installation. PMC cross laminated timber elements will not contribute to the water tightness, but elements directly exposed to weather shall receive a suitable waterproofing or roof covering. Waterproofing and roof covering are not covered by this ETA.

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)	
Bending[2)]	3.9 Description, level
Tension and compression[2)]	3.9 Description, level
Shear[2)]	3.9 Description, level
Embedment strength	3.9 Description, level
Creep and duration of the load	3.9 Description, level
Dimensional stability	3.9 Description, level
In-service environment	3.9 Description
Bond integrity	3.9 Description
3.2 Safety in case of fire (BWR2)	
Reaction to fire	In accordance with Commission Decision 2003/43/EC the solid wood slab elements covered by this ETA for use as wall, roof, ceiling and special construction components comply with Euroclass D-s2,d0 according to EN 13501-1. For the use as floor construction components they comply with Euroclass D-FL-s1. The boundary conditions stated in the commission decision have to be attended for this classification. Provision for this classification is that possible surface treatments do not essentially change the behaviour in fire.
3.3 Hygiene, health and the environment (BWR3)	
Influence on air quality	No performance assessed
Water vapour permeability – Water vapour transmission	Water vapour resistance factor μ for solid wood slab is 50
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 60 mm
3.5 Protection against noise (BWR5)	No performance assessed

Characteristic	Assessment of characteristic
3.6 Energy economy and heat retention (BWR6)	
Thermal conductivity	The design value of thermal conductivity to be used in design calculations of the solid wood slab is λ = 0,12 W/(mK). This value can be used in thermal resistance calculations according to EN ISO 6946.
Air permeability	No performance assessed
Thermal inertia	The design value of thermal inertia to be used in design calculations of the solid wood slab is c_p = 1600 J/(kg K).

3.9 Mechanical resistance and stability

Mechanical properties
The mechanical properties of the PMC cross laminated timber elements are given in Annex 2.

Resistances and stiffness values shall be calculated according to EN 1995-1-1, the design principles given in Annex 3 shall be taken into account. Joint design and embedding strength values given in EN 1995-1-1 for solid timber shall be used.

Tension perpendicular to the solid wood slab shall be avoided. Fasteners shall be applied to cover tension forces perpendicular to the solid wood slab.

Dimensional stability
Tolerances of dimensions
Tolerances of dimensions are given in table 1.

Table 1. Tolerances of the PMC cross laminated timber elements

Thickness (depth)	h	± 1 mm
Length	l	± 3 mm
Width	b	± 3 mm

Stability of dimensions
Moisture content of the PMC cross laminated timber elements varies between 6 and 15 %. However, during manufacturing the difference between the laminations within one element does not exceed 5 %. Due to changing temperature and relative humidity of the surrounding air the moisture content of the PMC will continuously change. Tolerances are given in the specified mean moisture content, 10, 11 or 12 %.

Thermal expansion
Normally, thermal expansion is not relevant for timber structures. Thermal expansion coefficients as given in EN 1991-1-5, Annex C Table C1, shall be used when needed.

In-service environment
See II.2. of this ETA.

Bond integrity
Bond integrity is in accordance with EAD 130005-00-0304.

3.10 Aspects related to the performance of the product

Design
Verification of stability of the works including application of loads on the PMC cross laminated timber elements is outside the scope of this ETA.

Fitness for the intended use is given provided that
- Design of the solid wood slabs shall follow the Eurocodes system (EN 1990, adequate parts of EN 1991, EN 1995-1-1 and EN 1995-1-2) and this ETA.
- Especially, the mechanical properties of PMC cross laminated timber elements as given in Annex 2 and design principles given in Annex 3 shall be used.
- Design of the PMC cross laminated timber elements is carried under the responsibility of an engineer experienced in solid wood slab elements
- PMC cross laminated timber elements are protected adequately against weather so that the conditions correspond to service classes 1 and 2
- PMC cross laminated timber elements are installed correctly.

This ETA is based on the assumption that structural design and any other plans needed have been made correctly according to the regulations valid on the building site.

Execution of construction works
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. This advice should be followed by the user of the product.

PMC cross laminated timber elements shall be installed on the basis of a specific structural design for each installation. Installation shall be made by appropriately qualified personnel, following an installation plan and relevant construction details worked out for each individual building project.

The completed building (the works) shall comply with the building regulations (regulations on the works) applicable in the Member States in which the building is to be constructed. The procedures foreseen in the Member State for demonstrating compliance with the building regulations shall also be followed by the entity held responsible for this act. An ETA for a solid wood slab element does not amend this process in any way.

4 Attestation and verification of constancy of performance (AVCP)

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 foreseen 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 2020-07-20 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex 1
Description of Schilliger PMC CLT

Cross sections and sizes

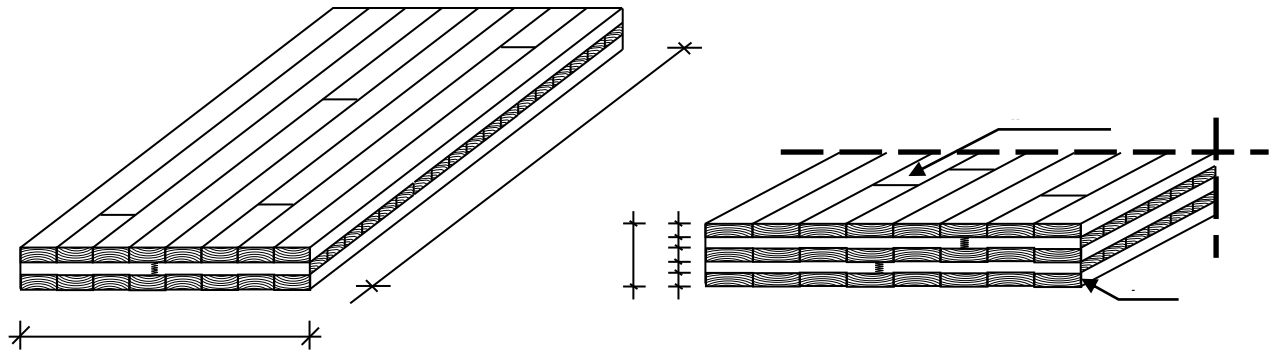

Figure 1-1. PMC cross laminated timber element, principal drawing

The PMC cross laminated timber element is illustrated in Figure 1-1. Maximum thickness is 0,5 m, maximum width 3,4 m and maximum length 18,0 m. Number of cross laminated layers varies from 3 to 33. The lay-up is always so, that every second lamination is turned 90 °, | - | - | - | - | etc. Lamination thickness is between 9 and 50 mm. Cross sections can be symmetrical and have an uneven number of laminations or can be even with adjacent board layers oriented parallel to each other, provided the number of parallel board layers does not exceed 3 and the accumulated thickness of parallel board layers does not exceed 90 mm. Lamination thickness within one element may vary. Lamination thickness within one element may vary. Number and thickness of the laminations are designed case by case. Surface of the elements is planed.

The type of cross section is given by a code, e.g:

"PMC 60 mm (20/20/20) längs B/D" means board thickness of 60 mm with three layers 20 mm; first and last layer are along the longer side of the element. The top layer is for visible use, the bottom layer is for non visible use.

"PMC 120 mm (20/30/20/30/20) quer D/D" means board thickness of 120 mm with 5 layers 20mm and 30 mm first and last layer are perpendicular to the longer side of the element. Both sides of the board are in a non visible quality.

Mean density of PMC cross laminated timber elements is at least 400 kg/m³ for C24 and 370 kg/m^3 for C16

Materials

PMC cross laminated timber elements are manufactured of solid softwood laminations. The species used is spruce *(Picea abies)*, fir *(Abies alba)* or equivalent softwood. The laminations comply with EN 14081-1. Strength class of the outmost layer is C16 or C24, see annex 2. For the C24 panels, the inner layers are composed of C24 (at least 85 %) and C16 (less than15 %).

Laminations are finger jointed, the joints comply with EN 14080.

Annex 2
Mechanical properties of the PMC cross laminated timber elements

Mechanical actions perpendicular to the solid wood slab

The following values for mechanical properties shall be used, when design calculations are made according to the principles given in Annex 3.

Property	**Value in N/mm²**	
	C16	**C24**
Bending strength $f_{m,k}$	16	24
Compression strength $f_{c,90,k}$	2,2	2,5
Tension strength $f_{t,90,k}$	0,4	0,4
Shear strength perpendicular to the grain of the boards $f_{R,v,k}$	1,1	1,1
Shear strength parallel to the grain of the boards $f_{v,k}$	3,2	4,0
Modulus of elasticity parallel to the grain of the boards $E_{0,mean}$	8400	11500
Modulus of elasticity perpendicular to the grain of the boards $E_{90,mean}$	300	390
Shear modulus parallel to the grain of the boards G_{mean}	650	650
Shear modulus perpendicular to the grain of the boards $G_{R,mean}$	20	50

Mechanical actions in plane of the solid wood slab

The following values for mechanical properties shall be used, when design calculations are made according to the principles given in Annex 3.

Property	**Value in N/mm²**	
	C16	**C24**
Bending strength $f_{m,k}$	16	24
Compression strength $f_{c,0,k}$	17	24
Tension strength $f_{t,0,k}$	10,0	16,5
Shear strength parallel to the grain of the boards $f_{v,k}$	3,2	3,2
Modulus of elasticity parallel to the grain of the boards $E_{0,mean}$	8400	11500
Shear modulus parallel to the grain of the boards G_{mean}	650	650

Creep and duration of load

The following modification factors, k_{mod} and k_{def} as defined in Eurocode 5, shall be used.

Duration of load	Actions perpendicular and in plane to the slab k_{mod}	
	Service class 1	Service class 2
Permanent	0,60	0,60
Long term	0,70	0,70
Medium term	0,80	0,80
Short term	0,90	0,90
Instantaneous	1,10	1,10

Actions perpendicular to the slab k_{def}		Actions in plane of the slab k_{def}	
Service class 1	Service class 2	Service class 1	Service class 2
0,80	1,00	0,60	0,80

Annex 3
Design principles of the PMC cross laminated timber elements

Mechanical 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 Annex 2. Thus, with the symbols as defined in Figure 3-1, the following equations apply:

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

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

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

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

$$\sigma_{r,i} = \pm \frac{M}{I_{ef}} \cdot \left(\gamma_i a_i + \frac{d_i}{2} \right) \qquad \tau_{max} = \frac{V \gamma_i S_i}{I_{ef} \cdot b}$$

For symmetrical layups, a_2=0 and γ_1=γ_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 solid wood slabs with more than 5 layers, computer programs based on the same principles shall be used.

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 may be multiplied by a system strength factor

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

n = number of adjoined boards along the width of the element.

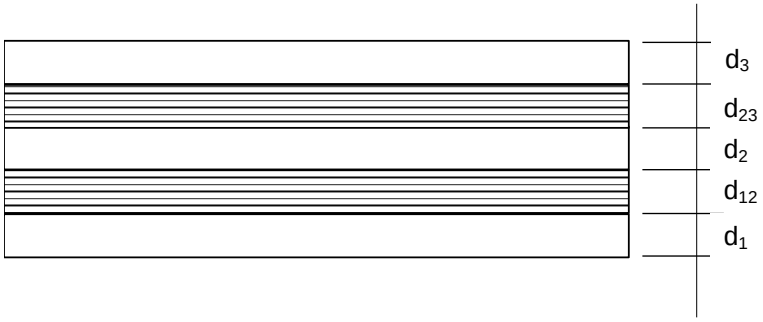

Figure 3-1. Symbols used in the calculations. Layers effective in bending are d_1, d_2 and d_3. Rolling shear layers are $d_{12}$and d_{23}.

Mechanical actions in plane of the solid wood slab

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

For the design of solid wood slabs the characteristic strength and stiffness values according to Annex 2 shall be used.

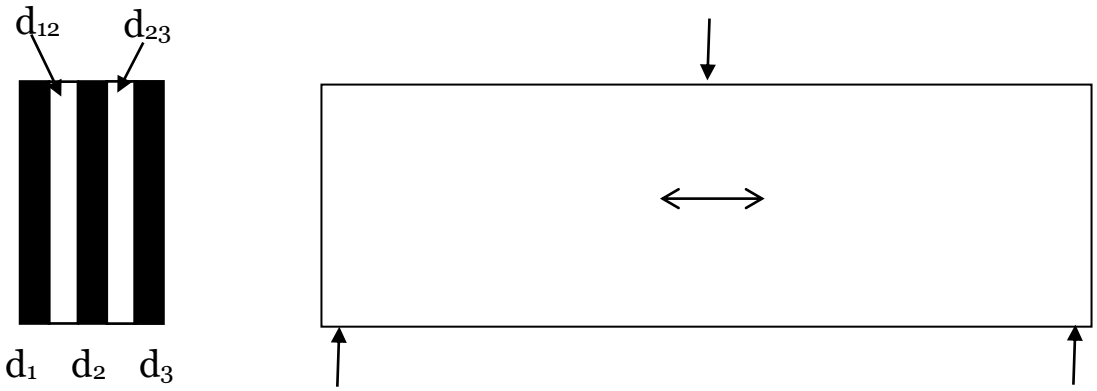

Figure 3-2. Symbols used in the calculations. Effective layers are either d_1, d_2 and d_3 or d_{12} and d_{23}. This depends on the grain direction of the layers. In the case shown layers d_1, d_2 and d_3 are effective and their grain direction of is shown by an arrow.