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European Technical Assessment ETA 08/0238 of 28/08/2018

I General Part

Technical Assessment Body issuing the ETA	**Eurofins Expert Services LTD**
Trade name of the construction product	**Schilliger Grossformatplatte GFP/Crosslam**
Product family to which the construction product belongs	Solid wood slab elements to be used as structural elements in buildings
Manufacturer	**Schilliger Holz-Industrie AG** Haltikon 33 CH-6403 Kuessnacht Switzerland
Manufacturing plant	Schilliger Holz- Industrie AG Haltikon 33 CH-6403 Kuessnacht Switzerland
This European Technical Assessment contains	12 pages including 3 Annexes which form an integral part of this assessment
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
This ETA replaces	ETA 08/0238 published June 10, 2013

II Specific Part

1. Technical description of the product

GFP/Crosslam 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 GFP/Crosslam cross laminated timber only applies for untreated elements and does not cover any effects of surface treatments, timber preservatives or flame retardants.

Maximum thickness of GFP/Crosslam cross laminated timber elements is 0,5 m, maximum width 3,4 m and maximum length 13,7 m. Number of cross laminated layers varies from 3 to 33. Lamination thickness is between 9 and 50 mm. The materials, dimensions and tolerances are given in Annex 1.

2. Specification of the intended uses in accordance with the applicable EAD

2.1. Intended uses and in-service environment

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 Grossformatplatte GFP/Crosslam 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. GFP/Crosslam 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.

2.2. Working life

The provisions made in this European Technical Assessment are based on an assumed intended working life of the solid wood slab of 50 years[1].

[1] This means that it is expected that when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements of the works. The indications given as to the working life of the solid wood slab cannot be interpreted as a guarantee given by the producer or the assessment body. They should only be regarded as a means for the specifiers to choose the appropriate criteria for the solid wood slabs in relation to the expected, economically reasonable working life of the works.

2.3. Design

Verification of stability of the works including application of loads on the GFP/Crosslam 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 GFP/Crosslam cross laminated timber elements as given in Annex 2 and design principles given in Annex 3 shall be used.
- Design of the GFP/Crosslam cross laminated timber elements is carried under the responsibility of an engineer experienced in solid wood slab elements
- GFP/Crosslam cross laminated timber elements are protected adequately against weather so that the conditions correspond to service classes 1 and 2
- GFP/Crosslam 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.

2.4. 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.

GFP/Crosslam 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 installation plan shall be based on the manufacturer's general guide and provisions for installing deposited at Eurofins Expert Services Ltd.

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.

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

Table 1. Basic requirements for construction works and essential characteristics

Basic requirement and essential characteristics	Performance
BWR 1. Mechanical resistance and stability[1)]	
Bending[2)]	3.1 Description, level
Tension and compression[2)]	3.1 Description, level
Shear[2)]	3.1 Description, level
Embedment strength	3.1 Description, level
Creep and duration of the load	3.1 Description, level
Dimensional stability	3.1 Description, level
In-service environment	3.1 Description
Bond integrity	3.1 Description
BWR 2. Safety in case of fire	
Reaction to fire	3.2 Class
Resistance to fire	No performance assessed
BWR 3. Hygiene, health and the environment	
Content, emission and/or release of dangerous substances	3.3 Description, class
Water vapour permeability – Water vapour transmission	3.3 Level
BWR 4. Safety and accessibility in use	
Impact resistance	3.4 Description
BWR 5. Protection against noise	
Airborne sound insulation	No performance assessed
Impact sound insulation of floors	No performance assessed
Sound absorption	No performance assessed
BWR 6. Energy economy and heat retention	
Thermal conductivity	3.5 Level
Air permeability	No performance assessed
Thermal inertia	3.5 Level

1) This characteristic also relates to BWR4

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

3.1. Mechanical resistance and stability, BWR 1

Mechanical properties

The mechanical properties of the GFP/Crosslam 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. Fully threaded screws 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 GFP/Crosslam cross laminated timber elements

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

Stability of dimensions

Moisture content of the GFP/Crosslam cross laminated timber elements varies between 8 and 14 %. However, during manufacturing the difference between the laminations within one element does not exceed 4 %. Due to changing temperature and relative humidity of the surrounding air the moisture content of the GFP/Crosslam 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 2.1 of this ETA.

Bond integrity

Bond integrity fulfils the requirements of the EAD 130005-00-0304.

3.2. Safety in case of fire, BWR 2

Reaction to fire

In accordance with Commission Decision 2003/43/EC the solid wood slab elements covered by this European technical assessment for use as wall, roof, ceiling and special construction components comply with Euroclass D-s2,d0 according to EN 13501-1. 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.

Note: A European reference fire scenario for façades has not been laid down. In some Member States, the classification of the solid wood slabs according to EN 13501-1 might not be sufficient for the use in façades. An additional assessment of the solid wood slabs according to national provisions (e.g. on the basis of a large scale test) might be necessary to comply with Member State regulations, until the existing European classification system has been completed.

3.3. Hygiene, health and environment, BWR 3

Content, emission and/or release of dangerous substances

No recycled wood has been used in the manufacturing of the solid wood slab. The product does not contain added formaldehyde.

In addition to the specific clauses relating to dangerous substances contained in this 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 EU Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

Water vapour permeability – Water vapour transmission

Water vapour resistance factor μ for solid wood slab is 50.

3.4. Safety and accessibility in use, 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.

3.5. Energy economy and heat retention, BWR 6

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.

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).

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

According to the Decision 97/176/EC of the European Commission[2], as amended by 2001/596/EC[3], 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 Eurofins Expert Services Ltd.

Issued in Espoo on August 28, 2018
by Eurofins Expert Services Ltd

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[2] Official Journal of the European Communities L 73/19 of 14 March 1997

[3] Official Journal of the European Communities L 209/33 of 2 August 2011

ANNEX 1
DESCRIPTION OF SCHILLIGER GROSSFORMATPLATTE GFP/CROSSLAM

1 Cross sections and sizes

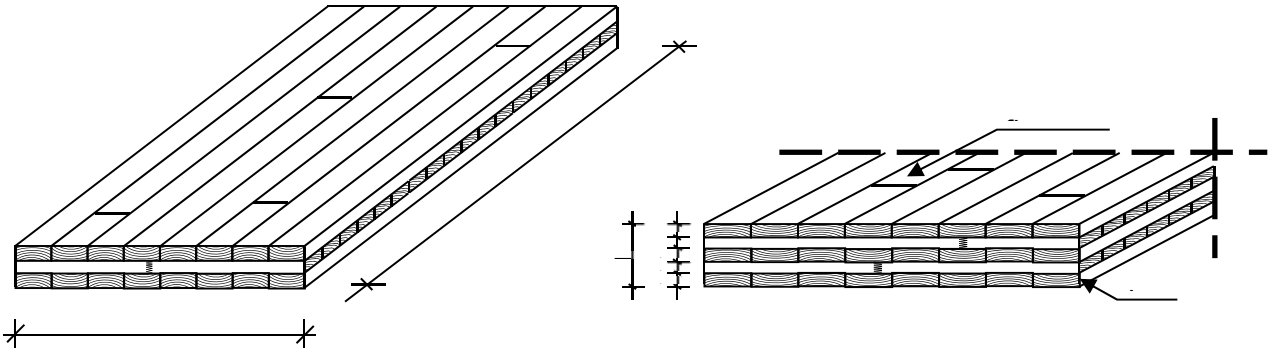

Figure 1-1. GFP/Crosslam cross laminated timber element, principal drawing

The GFP/Crosslam cross laminated timber element is illustrated in Figure 1-1. Maximum thickness is 0,5 m, maximum width 3,4 m and maximum length 13,7 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 are always symmetrical and have an uneven number of laminations. 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:

"GFP/Crosslam 60 mm (20/20/20) längs B/C" 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.

"GFP/Crosslam 120 mm (20/30/20/30/20) quer C/C" 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 GFP/Crosslam cross laminated timber elements is at least 400 kg/m³.

2 Materials

GFP/Crosslam 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 C24. 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 GFP/CROSSLAM CROSS LAMINATED TIMBER ELEMENTS

3 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**
Bending strength $f_{m,k}$	24
Compression strength $f_{c,90,k}$	2,5
Tension strength $f_{t,90,k}$	0,4
Shear strength perpendicular to the grain of the boards $f_{R,v,k}$	1,1
Shear strength parallel to the grain of the boards $f_{Rv,k}$	4,0
Modulus of elasticity parallel to the grain of the boards $E_{0,mean}$	11500
Modulus of elasticity perpendicular to the grain of the boards $E_{90,mean}$	390
Shear modulus parallel to the grain of the boards G_{mean}	650
Shear modulus perpendicular to the grain of the boards $G_{R,mean}$	50

4 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**
Bending strength $f_{m,k}$	24
Compression strength $f_{c,0,k}$	24
Tension strength $f_{t,0,k}$	16,5
Shear strength parallel to the grain of the boards $f_{v,k}$	3,2
Modulus of elasticity parallel to the grain of the boards $E_{0,mean}$	11600
Shear modulus parallel to the grain of the boards G_{mean}	650

5 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 GFP/CROSSLAM CROSS LAMINATED TIMBER ELEMENTS

6 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}.

7 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.

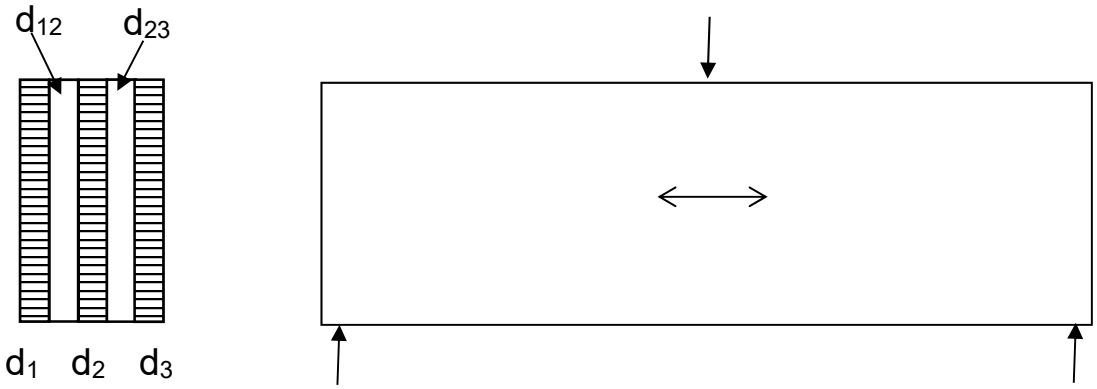

Figure 3-2. Symbols used in the calculations. Effective layers are either d_1, d_2 and d_3 or d_{12} and d_{23}. This depends on the grain direction of the layers. In the case shown layers d_1, d_2 and d_3 are effective and their grain direction of is shown by an arrow.