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European Technical Assessment

ETA-13/0083
of 30.11.2018

General part

Technical Assessment Body issuing the European Technical Assessment

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

Trade name of the construction product

bio-xlam®

Product family to which the construction product belongs

Solid wood slab element – Element of mechanically jointed timber boards to be used as a structural element in buildings

Manufacturer

LIGNA CONSTRUCT GmbH
Tusengrabl 23
39010 St. Pankraz (BZ)
Italy

Manufacturing plants

LIGNA CONSTRUCT GmbH
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39010 St. Pankraz (BZ)
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This European Technical Assessment contains

15 pages including 4 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

European Assessment Document
EAD 130002-00-0304 “Solid wood slab element - element of dowel jointed timber boards to be used as a structural element in buildings”

This European Technical Assessment replaces

European technical approval ETA-13/0083 with validity from 25.03.2013 to 24.03.2018.

Remarks

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

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may be made with the written consent of Austrian Institute of Construction Engineering. Any partial reproduction has to be identified as such.

SPECIFIC PARTS

1 Technical description of the product

1.1 General

This European Technical Assessment (ETA)¹ applies to the mechanically jointed cross laminated timber "bio-xlam®". bio-xlam® is made of softwood boards which are jointed together with clamps 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 mechanically jointed cross laminated timber is shown in Annex 1, Figure 1 and Figure 2. Surfaces are planed.

bio-xlam® consists of at least five adjacent layers and up to seven adjacent layers which are arranged perpendicular to each other. With regard to the thickness of the solid wood slab element, thicknesses and orientations of individual layers are symmetrically assembled. In case of serious deviations from symmetry potential effects should be investigated.

Mechanically jointed 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 bio-xlam®, 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.

1.2.2 Clamps

For mechanically jointing the single boards, clamps according to EN 14592 are used. They are made of zinc coated carbon steel and CE-marked.

¹ The ETA-13/0083 was firstly issued in 2013 as European technical approval with validity from 25.03.2013 and amended and converted in 2018 to the European Technical Assessment ETA-13/0083 of 30.11.2018.

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 factory production control certification body involved in the assessment and verification of constancy of performance procedure, is handed over to the notified factory production control certification body.

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

2.1 Intended use

bio-xlam® is intended to be used as a structural or non-structural element in buildings and timber structures.

bio-xlam® is subjected to static and quasi static actions.

bio-xlam® 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

bio-xlam® is 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 jointed together to the required thickness of the cross laminated timber. There shall be no finger joints or butt joints.

At least 2 clamps are required at each node of crosswise jointed layers build-up of boards with width 80 mm / 200 mm, 4 clamps for nodes build-up with boards 200 mm / 200 mm and 6 clamps for nodes build-up with boards 200 mm / 320 mm. The edges of the boards need not to be jointed.

Design

The European Technical Assessment only applies to the manufacture and use of bio-xlam®. Verification of stability of the works including application of loads on the product is not subject to the European Technical Assessment.

The following conditions shall be observed:

- Design of bio-xlam® is carried out under the responsibility of an engineer experienced in such products.
- Design of the works shall account for the protection of bio-xlam®.
- bio-xlam® is installed correctly.

Design of the element of mechanically jointed timber boards may be according to EN 1995-1-1 and EN 1995-1-2, taking into account the 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.

³ Reference documents are listed in Annex 8.

Fixing of objects

All fixed objects that are subject to tensile forces shall in any case be anchored in mechanically jointed cross laminated timber with an anchoring depth of at least 3 layers. For heavy weight objects a deeper anchorage has to be provided. This refers in particular to kitchen cabinets, hot water boilers, handrails, etc.

The specifications of the installation instructions shall be observed.

2.3 Working life/Durability

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life of bio-xlam® of 50 years, when installed in the works, provided that the element is 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.

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

3.1 Essential characteristics of the product

Table 1: Essential characteristics and product performance

No	Essential characteristic	Product performance
Basic requirement for construction works 1: Mechanical resistance and stability ¹⁾		
1	Load-bearing capacity and stiffness regarding mechanical actions perpendicular to the solid wood slab element	Annex 2
2	Load-bearing capacity and stiffness regarding mechanical actions in plane of the solid wood slab element	Annex 2
3	Embedding strength / Withdrawal strength	Annex 2
4	Creep and duration of the load	Annex 2
5	Dimensional stability	Annex 2
6	Aspects of durability	Annex 2
Basic requirement for construction works 2: Safety in case of fire		
7	Reaction to fire	Annex 2
8	Resistance to fire	Annex 2

⁴ 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 may also be shorter than referred to above.

Basic requirement for construction works 3: Hygiene, health and the environment		
9	Content, emission and/or release of dangerous substances	3.1.1
10	Water vapour permeability	Annex 2
Basic requirement for construction works 4: Safety and accessibility in use		
11	Same as BWR 1	Annex 2
Basic requirement for construction works 5: Protection against noise		
12	Airborne sound insulation	No performance assessed.
13	Impact sound insulation	No performance assessed.
14	Sound absorption	No performance assessed.
Basic requirement for construction works 6: Energy economy and heat retention		
15	Thermal resistance	Annex 2
16	Air permeability	Annex 2
17	Thermal inertia	Annex 2
1) These characteristics also relate to BWR 4.		

3.1.1 Hygiene, health and the environment

The release of dangerous substances is determined according to EAD 130002-00-0304, “Solid wood slab element – Element of dowel jointed timber boards to be used as a structural element in buildings”, Edition July 2015. No dangerous substances is the performance of bio-xlam® 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 bio-xlam® 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 5 of Regulation (EU) № 305/2011 has been made in accordance with the European Assessment Document EAD 130002-00-0304, Solid wood slab element – Element of dowel jointed timber boards to be used as a structural element in buildings, edition July 2015.

3.2.2 Identification

The European Technical Assessment for bio-xlam® 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 bio-xlam[®] is System 2+. System 2+ is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.3., and provides for the following items

(a) The manufacturer shall carry out:

- (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 that product;
- (ii) factory production control;
- (iii) testing of samples taken at the manufacturing plant by the manufacturer in accordance with a prescribed test plan⁵.

(b) The notified factory production control certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of conformity of the factory production control on the basis of the outcome of the following assessments and verifications carried out by that body:

- (i) initial inspection of the manufacturing plant and of factory production control;
- (ii) continuing surveillance, assessment and evaluation of factory production control.

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

Manufacturers undertaking tasks under Systems 2+ shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Manufacturers shall therefore not undertake the tasks referred to in point 4.1 (a)(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 the product 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 and tests 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.

⁵ The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the notified factory production control 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.

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 presented to the notified factory production control certification body involved in continuous surveillance. On request the records 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 of the factory production control issued by the notified factory production control certification body, the manufacturer shall draw up a declaration of performance.

5.2 Tasks for the notified factory production control certification body

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

The notified factory production control certification body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of bio-xlam® 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 factory production control 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 shall be made available on demand by the notified factory production control 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 conformity of the factory production control shall be withdrawn.

Issued in Vienna on 30.11.2018
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits
Managing Director

Table 3: Product characteristics of bio-xlam®

BWR	Essential characteristic	Method of verification	Level / Class / Description
1	Mechanical resistance and stability		
	1. Mechanical actions perpendicular to mechanically jointed cross laminated timber ¹⁾		
	Strength class of boards	EN 338	Cover layer: C24 Inner layer: ≤ 20 % C16 ≥ 80 % C24
	Modulus of elasticity		
	– parallel to the grain of the boards $E_{0, mean}$	I_{eff} , Annex 3 EAD 130002-00-0304, 2.2.1.1	770 MPa ²⁾
	– perpendicular to the grain of the boards $E_{90, mean}$	EN 338	300 MPa
	Shear modulus		
	– parallel to the grain of the boards $G_{090, mean}$	EN 338	560 MPa
	Bending strength		
	– parallel to the grain of the boards $f_{m, k}$	W_{eff} , Annex 3 EAD 130002-00-0304, 2.2.1.1	8.0 MPa
Tensile strength			
In general mechanically jointed solid wood slab element elements are unsuitable for tension perpendicular to the plane of the slab. Fasteners shall be applied to overcome such design situations.			
Compressive strength			
– perpendicular to the grain of the boards $f_{c, 90, k}$	EN 338	2.2 MPa	
Shear strength			
– parallel to the grain of the boards $f_{v, 090, k}$	EN 338	0.5 MPa	

NOTE

- ¹⁾ For calculation of mechanical actions perpendicular to the mechanically jointed cross laminated timber the distance between the clamps $s_i = 5,13$ mm and the slip modulus $K_i = 52170$ N/mm per shear plane, according to EN 1995-1-1, Annex B.
- ²⁾ 1 MPa = 1 N/mm²
- ³⁾ For calculation of beams above openings only the single boards shall be taken into account. Openings may also be constructed through renewal.

bio-xlam®	Annex 2
Characteristic data of mechanically jointed cross laminated timber	of European Technical Assessment ETA-13/0083 of 30.11.2018

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BWR	Essential characteristic	Method of verification	Level / Class / Description	
1	Mechanical resistance and stability			
	2. Load bearing capacity and stiffness regarding mechanical actions in plane of the solid wood slab element ³⁾			
	Strength class of boards	EN 338	Cover layer: C24 Inner layer: ≤ 20 % C16 ≥ 80 % C24	
	Modulus of elasticity – parallel to the grain of the boards $E_{0, mean}$	A_{net}, I_{net} , Annex 3 EAD 130002-00-0304, 2.2.1.2	5 layer 6 500 MPa	7 layer 7 500 MPa
	Bending strength – parallel to the grain of the boards $f_{m, k}$	W_{net} , Annex 3 EAD 130002-00-0304, 2.2.1.2	5 layer 14 MPa	7 layer 18 MPa
	Tensile strength – parallel to the grain of the boards $f_{t, 0, k}$	EN 338	5 layer 8 MPa	7 layer 11 MPa
	Compressive strength – parallel to the grain of the boards $f_{c, 0, k}$	EN 338	5 layer 16 MPa	7 layer 18 MPa
	Shear strength – parallel to the grain of the boards $f_{v, 090, k}$	A_{net} , Annex 3 EAD 130002-00-0304, 2.2.1.2	1.0 MPa	
	Shear modulus (in plane) – in plane G^*_{xy} for max. horizontal load $F_{v, ser}$	EAD 130002-00-0304, 2.2.1.2	5 layer 20 MPa 6.6 kN	7 layer 20 MPa 8.8 kN

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Annex 2

Characteristic data of mechanically jointed cross laminated timber

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

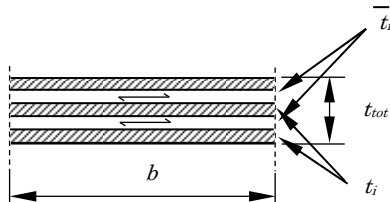
General

Due to the perpendicular orientation of the boards, mechanically jointed 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 B shall be taken.

Mechanical actions perpendicular to cross laminated timber



Where

t_i Thickness of board layers in direction of mechanical actions

\bar{t}_i Thickness of board layers perpendicular to direction of

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 $\frac{s_i}{K_i}$ of EN 1995-1-1 should be used.

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

$$A_i = b \cdot t_i$$

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

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

$$h_{tot} = \sum_i (t_i + \bar{t}_i)$$

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

Where

I moment of inertia

I_{eff} effective moment of inertia

s spacing of fasteners according to EN 1995-1-1

K slip modulus according to EN 1995-1-1

b width of the member of cross laminated timber

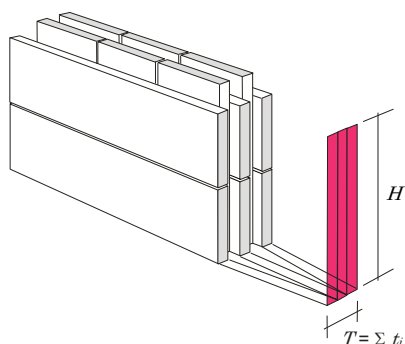
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Annex 3

Design consideration for mechanically jointed cross laminated timber

of European Technical Assessment
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Mechanical actions in plane of the solid wood slab



Where

$H \leq 400$ mm

t_i Thickness of board layers in direction of mechanical actions

\bar{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 strength

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

Section modulus

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

$$A_{x,net} = H \cdot \sum_i \bar{t}_i$$

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

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Design consideration for mechanically jointed cross laminated timber

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