



EUROPEAN ASSESSMENT DOCUMENT

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PREFABRICATED WOOD SLAB ELEMENT MADE OF JOINTED CROSS LAMINATED LOG ELEMENTS TO BE USED AS A STRUCTURAL ELEMENT IN BUILDINGS

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD deals with prefabricated wood slab elements composed of minimum two cross laminated logs. The cross laminated logs are made of two outer lamellas of solid wood, finger jointed according to EN 15497, and an inner layer of a single-layer solid wood panel, which may be butt jointed, arranged perpendicular to each other and bonded together by gluing. Hereby, the grain direction of the outer lamellas is arranged in the direction of mechanical action. For the lateral connection of the laminated logs tongue and groove joints are arranged and additionally bonded together by gluing. The number of tongues and grooves is the same for every height. No load-bearing function is assigned to the lateral connection. The dimensions of the lateral tongue and groove connection shall be given in the ETA.

Timber species is European spruce, pine or larch.

The overall shape of the prefabricated wood slab element as well as the lateral connection of the cross laminated logs are shown in Figure 1. Minimum and maximum dimensions for the cross laminated logs and prefabricated wood slab elements are given in Table 1.

Figure 1: Principle structure of the prefabricated wood slab element composed of cross laminated logs and exemplary lateral connection of the cross laminated logs

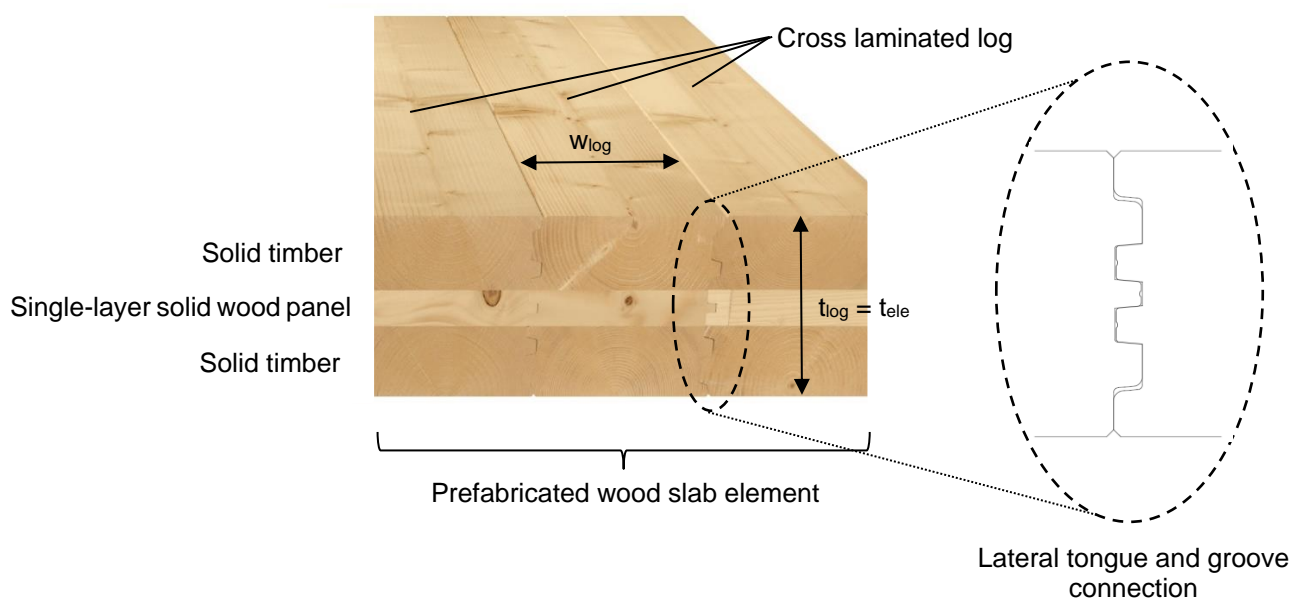


Table 1: Minimum and maximum dimensions for the cross laminated logs and prefabricated wood slab element

Min. and max. dimensions	mm
Min. width of cross laminated log $w_{log,min}$	150
Max. width of cross laminated log $w_{log,max}$	200
Min. thickness of cross laminated log $t_{log,min}$	80
Max. thickness of cross laminated log $t_{log,max}$	200
Min. thickness of prefabricated wood slab element $t_{ele,min}$	80
Max. thickness of prefabricated wood slab element $t_{ele,max}$	200
Min. width of prefabricated wood slab element $w_{ele,min}$	300

Max. width of prefabricated wood slab element $w_{ele,max}$	1 200
Max. length of prefabricated wood slab element $l_{ele,max}$	15 000
Service class	1 and 2
Moisture content	8 – 15 %
Min. number of cross laminated logs	2

The following structural adhesives are used for surface bonding, finger joints as well as the lateral connection of the cross laminated logs:

- Adhesives type I according to EN 301
- Adhesives type I according to EN 15425 and EN 14080, Annex B.2.

The glue line thickness of the surface bonding meets the requirements of EN 16351.

The surfaces preparations of the product (planed, grinded, brushed etc.) shall be given in the ETA.

The application of wood preservatives and flame retardants is not subject of the European Assessment Document.

This EAD is not applicable when used wood is used.

The product is not fully covered by the following harmonised technical specification: EAD 130022-00-0304 2015-04 due to deviating intended use and shape

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.

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.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The product is intended to be used as a structural element in buildings.

The product shall be subjected to static and quasi static actions only.

The product 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 prefabricated wood slab element in service.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the prefabricated wood slab element for the intended use 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.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works¹.

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 when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)

1.3.1 Cross laminated log element

A log made of two outer lamellas of solid wood of same thickness, which may be finger jointed in their longitudinal direction, and an inner layer of a single-layer solid wood panel arranged perpendicular to each other and bonded together by gluing. The thickness is at least 80 mm and not more than 200 mm and the width is at least 150 mm and not more than 200 mm. The thickness of the outer lamellae is at least 30 mm and not more than 80 mm, the thickness of the inner layer is at least 20 mm and not more than 50 mm.

¹ 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.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2 shows how the performance of the prefabricated wood slab element made of jointed cross laminated logs is assessed in relation to the essential characteristics.

Table 2 Essential characteristics of the prefabricated wood slab element and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability ¹⁾			
1	Bending ²⁾	2.2.1	Description, level
2	Tension and compression ²⁾	2.2.2	Description, level
3	Shear ²⁾	2.2.3	Description, level
4	Dimensional stability	2.2.4	Description, level
5	Durability of timber	2.2.5	Description, level
Basic Works Requirement 2: Safety in case of fire			
6	Reaction to fire	2.2.6	Class
7	Resistance to fire	2.2.7	Description, level
Basic Works Requirement 3: Hygiene, health and the environment			
8	Content, emission and/or release of dangerous substances	2.2.8	Description
9	Water vapour permeability – Water vapour transmission	2.2.9	Description, level
Basic Works Requirement 4: Safety and accessibility in use			
10	Same as BWR 1		
Basic Works Requirement 5: Protection against noise			
11	Airborne sound insulation	2.2.10	Description, level
12	Impact sound insulation	2.2.11	Description, level
13	Sound absorption	2.2.12	Description, level
Basic Works Requirement 6: Energy economy and heat retention			
14	Thermal conductivity	2.2.13	Description, level
15	Air permeability	2.2.14	Description, level
16	Thermal inertia	2.2.15	Description, level
¹⁾ This characteristic also relates to BWR 4. ²⁾ Load bearing capacity and stiffness regarding mechanical actions perpendicular to and in plane of the prefabricated wood slab element.			

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

2.2.1 Bending

Bending strength of cross laminated log

Bending strength and bending modulus of elasticity of the cross laminated log shall be verified according to EN 16351. Hereby, no load-bearing function is assigned to butt jointed single-layer solid wood panels.

Load bearing capacity and stiffness regarding mechanical actions in plane of the element

Bending tests may be performed following EN 16351, Annex F3.1, with measurement of local and global deformations. The tests should be carried out without lateral bonding of the cross laminated logs.

Alternatively the load bearing capacity (maximum moment) and the bending stiffness shall be calculated by consideration of members with orientation of grain in span direction only according to EN 1995-1-1, Annex B. The technical strength classes specified in EN 338 shall be used.

Bending strength and stiffness shall be calculated according to EN 14358, Clause 4 or by the calculation model given above. The characteristic bending strength and bending modulus of elasticity in MPa shall be given in the ETA.

Load bearing capacity and stiffness regarding mechanical actions perpendicular to the element

Bending tests shall be performed following EN 16351, Annex F3.1, with measurement of local and global deformations. The tests should be carried out without lateral bonding of the cross laminated logs.

Alternatively, calculation assisted by testing may be applied. For the calculation the same provisions as for bending in plane of the element apply. The results based on the calculation model have to be assessed by bending tests mentioned in the paragraph above.

In the course of this test, the strength of the finger joints in the lamellae of the cross laminated log shall be verified according to EN 15497. In addition the bonding quality shall be assessed by a delamination test according to EN 16351.

Bending strength and stiffness shall be calculated either by the calculation model given above or from the results of the bending tests according to EN 14358, Clause 4. In case of calculation assisted by testing, the calculation model has to be assessed by tests.

Bending strength and stiffness shall be calculated according to EN 14358, Clause 4. In case of calculation assisted by testing, the calculation model has to be assessed by tests. The characteristic bending strength and bending modulus of elasticity in MPa shall be given in the ETA.

2.2.2 Tension and compression

Compression

Testing of at least 15 samples per dimension and calculation according to the equations given in EN 408, Clause 15 and 16. The characteristic values shall be determined in accordance with EN 14358, Clause 4.

Alternatively, the compressive strength may be estimated by the characteristic value of strength of the cross laminated log.

Tension

Testing of at least 15 samples per dimension and calculation according to the equations given in EN 408, Clause 13. The characteristic values shall be determined in accordance with EN 14358, Clause 4. Sufficient load distribution must be ensured by uniform load introduction.

Alternatively, the tensile strength may be estimated by the characteristic value of strength of the cross laminated log.

Tension perpendicular to the prefabricated wood slab shall be avoided. Fasteners shall be applied to cover these forces.

2.2.3 Shear

Load bearing capacity and stiffness regarding mechanical actions in plane of the element

If the prefabricated wood slab elements are intended to be used as shear walls without sheathing, shear tests shall be performed following the principles of EN 594. Hereby, wall elements with dimensions according to EN 594 shall be loaded according to EN 594. Testing of shear walls shall be applied with all configurations intended for load configurations. The boundary conditions, such as anchoring of the elements etc., for which the tests results are valid, shall be given. From the tests the stiffness of the shear wall R and the ultimate shear force F_{\max} are determined. The test results shall be given in the ETA for the tested construction. The tests should be carried out without lateral bonding of the cross laminated logs.

Load bearing capacity and stiffness regarding mechanical actions perpendicular to the element

In general, the shear strength of the constituent timber members according to EN 338 can be used. If shear failure of the prefabricated wood slab element is already covered by the bending tests, the value derived from these tests may also be used.

Alternatively, shear tests may be performed following EN 16351, Annex F.3.2. Vector of momentum shall be in plane of the prefabricated wood slab element. In contrast to EN 16351 the forces shall be imposed approximately at a distance $2 \times h$ from the supports to result in shear failure. The tests should be carried out without lateral bonding of the cross laminated logs.

2.2.4 Dimensional stability

Dimensional stability shall be checked according to EAD 130022-00-0304, Clause 2.2.6.

2.2.5 Durability of timber

Durability of timber shall be assessed according to EN 350.

Timber species and the service classes as defined in EN 1995-1-1, Clause 2.3.1.3 shall be given in the ETA.

2.2.6 Reaction to fire

The prefabricated wood slab element is considered to satisfy the requirements for performance class D-s2,d0 of the characteristic reaction to fire in accordance with the EC Decision 2005/610/EC without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

Therefore the performance of the product is D-s2,d0.

When the product does not meet the provisions of EC Decision 2005/610/EC, the product shall be tested, using the test method(s) relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1.

2.2.7 Resistance to fire

The part of the works or assembled system in which the solid wood slab element is intended to be incorporated, installed or applied shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified according to EN 13501-2.

2.2.8 Content, emission and/or release of dangerous substances

The performance of the product related to the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer² after identifying the release scenarios (in accordance with EOTA TR 034) taking into account the intended use of the product and the Member States where the manufacturer intends his product to be made available on the market.

The identified intended release scenarios for this product and intended use with respect to dangerous substances are: IA1, IA2, S/W3

Emission of formaldehyde

If for bonding of the cross laminated log elements an adhesive which contains formaldehyde is applied the formaldehyde emission shall be tested and classified according to EN 16351.

The class of emission of formaldehyde shall be given in the ETA.

2.2.9 Water vapour permeability – Water vapour transmission

Water vapour permeability shall be assessed according to EN ISO 10456 and given in the ETA.

2.2.10 Airborne sound insulation

Testing according to EN ISO 10140-2 considering EN ISO 10140-1 and EN ISO 10140-5. The weighted sound reduction index, R_w (C; C_{tr}) shall be given according to EN ISO 717-1.

2.2.11 Impact sound insulation

Testing according to EN ISO 10140-3 considering EN ISO 10140-1 and EN ISO 10140-5. The weighted normalised impact sound pressure level, $L_{n,w}$ (C_i) shall be given according to EN ISO 717-2.

2.2.12 Sound absorption

Testing according to EN ISO 354. The results shall be given in the ETA according to EN ISO 11654.

2.2.13 Thermal conductivity

Thermal conductivity shall be assessed according to EN ISO 10456 and given in the ETA.

2.2.14 Air permeability

Testing according to EN 12114. Results shall be given according to EN 12207.

2.2.15 Thermal inertia

Thermal inertia shall be assessed according to EN ISO 10456 and given in the ETA.

² The manufacturer may be asked to provide to the TAB the REACH related information which he must accompany the DoP with (cf. Article 6(5) of Regulation (EU) No 305/2011).

The manufacturer is **not** obliged:

- to provide the chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
- to provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the “Indicative list on dangerous substances” of the SGDS.

Any information provided by the manufacturer regarding the chemical composition of the products may not be distributed to EOTA or to TABs.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: Decision 1997/176/EC as amended

The system is: 1

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.

Table 3 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]*					
1	Grading of timber members	Grading acc. to EN 14081	EN 14081	100 %	acc. to EN 14081
2	Finger joints	EN 16351	EN 16351	EN 16351	EN 16351
3	Bonding quality of cross laminated logs	EN 16351	EN 16351	EN 16351	EN 16351
4	Visual inspection of the prefabricated wood slab element	(1)	(1)	100 %	Per batch
5	Dimensions and shape	-	According to customers declaration	1	Per day and per changeover of working shift

¹⁾ According to the specification and configuration of the prefabricated wood slab element and their components.

3.4 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for the prefabricated wood slab element are laid down in Table 4.

Table 4 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the prefabricated wood slab element.	As defined in the control plan	As defined in the control plan	As defined in the control plan	1
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer (parameters according to Table 3 of this EAD).	As defined in the control plan	As defined in the control plan	As defined in the control plan	2 / year

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EAD 130022-00-0304 (2015-04): European Assessment Document for Monolithic or laminated beam and wall logs made of timber

EOTA TR 034 (2015.10): General BWR3 Checklist for EADs/ETAs – Dangerous substances

EN 301: Adhesives, phenolic and aminoplastic, for load-bearing timber structures – Classification and performance requirements

EN 338: Structural timber – Strength classes

EN 350: Durability of wood and wood-based products – Testing and classification of the durability to biological agents of wood and wood-based materials

EN 408: Timber structures – Structural timber and glued laminated timber – Determination of some physical and mechanical properties

EN 594: Timber structures – Test methods – Racking strength and stiffness of timber frame wall panels

EN 717-1: Wood-based panels - Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method

EN 789: Timber structures – Test methods – Determination of mechanical properties of wood based panels

EN 1995-1-1: Eurocode 5 – Design of timber structures – Part 1 1: General – Common rules and rules for buildings

EN 12114: Thermal performance of buildings – Air permeability of building components and building elements – Laboratory test method

EN 12207: Windows and doors – Air permeability – Classification

EN 13501-1: Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

EN 13501-2: Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services

EN 14080: Timber structures – Glued laminated timber and glued solid timber – Requirements

EN 14081-1: Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements

EN 14358: Timber structures – Calculation of characteristic 5-percentile values and acceptance criteria for a sample

EN 15425: Adhesives – One component polyurethane for load bearing timber structures – Classification and performance requirements

EN 15497: Structural finger jointed solid timber – Performance requirements and minimum production requirements

EN 16351: Timber structures – Cross laminated timber – Requirements

EN ISO 354: Acoustics – Measurement of sound absorption in a reverberation room

EN ISO 717-1: Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation

EN ISO 717-2: Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation

EN ISO 10140-1: Acoustics – Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products

EN ISO 10140-2: Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation

EN ISO 10140-3: Acoustics – Laboratory measurement of sound insulation of building elements – Part 3: Measurement of impact sound insulation

EN ISO 10140-5: Acoustics – Laboratory measurement of sound insulation of building elements – Part 5: Requirements for test facilities and equipment

EN ISO 10456: Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values

EN ISO 11654: Acoustics – Sound absorbers for use in buildings – Rating of sound absorption