EUROPEAN ASSESSMENT DOCUMENT

EAD 130002-00-0304

July 2015

Solid wood slab element

- element of dowel jointed timber boards 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

Solid wood slab element – element of dowel jointed timber boards to be used as a structural element in buildings – are mechanically jointed wood slab elements.

The solid wood slab element – element of dowel jointed timber boards is made of sawn timber boards, which are jointed with hardwood dowels in order to form a slab. In jointing the timber boards, the hardwood dowels are arranged in a predefined grid. The boards of the single layers are not running parallel but inclined with angles between 45° and 90°. Due to the inclined orientation of the boards, the solid wood slab element is able to transfer loads in all directions according to its condition of support. The wood used, timber boards and hardwood dowels, will be specified in the ETA including species, density etc. as relevant.

In addition to timber boards and hardwood dowels, the solid wood slab element may contain other components which will be specified in the ETA, as e.g. vapour barriers, building papers etc. The aim of these components is to enhance specific performances of the solid wood slab element, e.g. to improve air tightness.

The solid wood slab element – element of dowel jointed timber boards is manufactured with a maximum thickness of approximately 0,5 m and length and width according to the needs.

In figure 1 the principle structure of the solid wood slab element – element of dowel jointed timber boards, in figure 2 an example of the structure of the solid wood slab element for walls and in figure 3 an example of the structure of the solid wood slab element for floors are shown. These examples are not exhaustive.

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

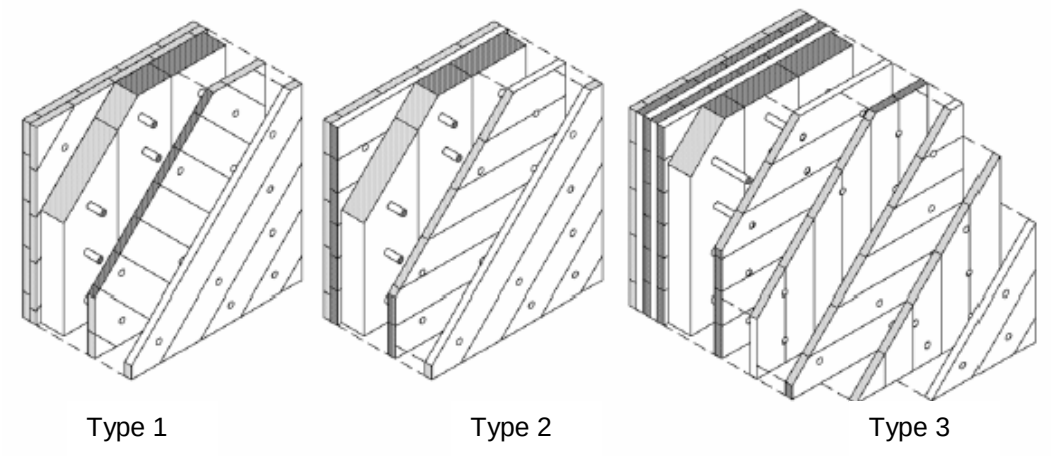
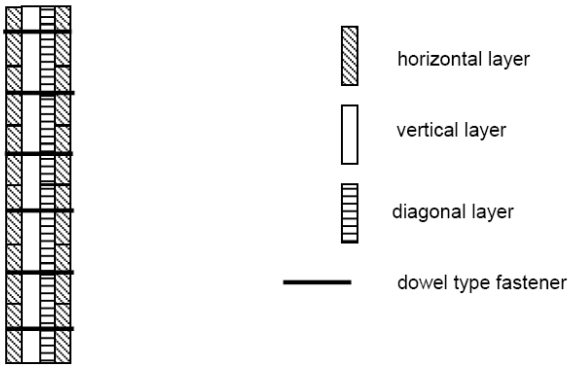
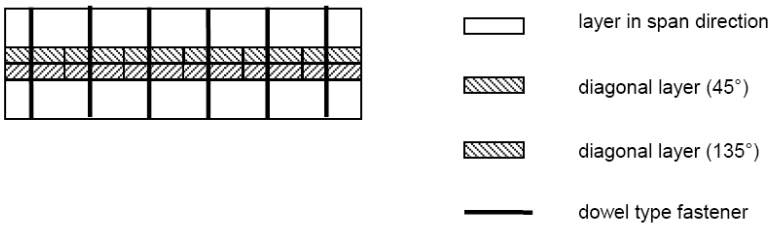


Figure 1: Principle structures of the solid wood slab element – element of dowel jointed timber boards



Wall element

Figure 2: Typical example of the structure of the solid wood slab element – element of dowel jointed timber boards – wall element



Floor element

Figure 3: Typical example of the structure of the solid wood slab element – element of dowel jointed timber boards – floor element

The product is not covered by a harmonised European standard.

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 solid wood slab element – element of dowel jointed timber boards is intended to be used as a structural element in buildings to construct walls, floors and/or roofs.

The solid wood slab element is subject to static and quasi static actions only.

Within a roof construction, the solid wood slab element will not contribute to the water tightness, but will receive a suitable waterproofing or roof covering. Waterproofing and roof covering are not covered by this EAD and the ETA.

The solid wood slab element is intended to be used in service class 1 and 2 according to EN 1995-1-1 para 2.3.1.3 in regards to moisture content in the materials and the corresponding temperature and the relative humidity of the surrounding.

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 wood slab element for the intended use of 50 years when installed in the works provided that the wood slab element is subject to appropriate installation (see 1.1). 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 works.

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

Dowel type fastener: a solid piece of wood of normally cylindrical shape and circular cross section, and of sufficient length to join the layers of the solid wood slab element.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of solid wood slab element – element of dowel jointed timber boards is established in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
Method 1 and 2			
1	Load bearing capacity and stiffness regarding mechanical actions perpendicular to the solid wood slab element	2.2.1.1	Level
2	Load bearing capacity and stiffness regarding mechanical actions in plane of the solid wood slab element	2.2.1.2.	Level
3	Embedding strength Withdrawal strength	2.2.1.3	Level
4	Creep and duration of load	2.2.1.4	Level
5	Dimensional stability	2.2.1.5	Level
Method 3			
6	Related to Basic Works Requirement 1	2.2.1	Level
7	Aspects of durability	2.2.12	Description
Basic Works Requirement 2: Safety in case of fire			
8	Reaction to fire	2.2.2	Class
Method 1 and 2			
9	Fire resistance	2.2.3	Class
Method 3			
10	Fire resistance	2.2.3	Class

No	Essential characteristic	Assessment method	Expression of product performance
Basic Works Requirement 3: Hygiene, health and the environment			
11	Content, emission and/or release of dangerous substances	2.2.4	Description
12	Water vapour permeability	2.2.5	Level
Basic Works Requirement 5: Protection against noise			
13	Airborne sound insulation	2.2.6	Level
14	Impact sound insulation	2.2.7	2.2.5.2
15	Sound absorption	2.2.8	2.2.5.3
Basic Works Requirement 6: Energy economy and heat retention			
16	Thermal resistance	2.2.9	Level
17	Air tightness	2.2.10	Level
18	Thermal inertia	2.2.11	Level

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

Characterisation of products to be assessed shall be done in accordance with available specifications, notably timber grading, density and reaction to fire classification.

2.2.1 Mechanical resistance and stability

General

Mechanical resistance and stability can be verified by combinations of calculations and tests (also referred to as design assisted by testing). Design assisted by testing can be used to apply test results obtained from one type of structure to another type (e.g. varying thickness or lay-up) or to another use condition (e.g. humidity or eccentricity of the load).

Design assisted by testing shall be carried out according to EN 1990. Accompanying calculations shall be based on EN 1995-1-1.

When characteristic values shall be determined, the number of tests for each configuration shall be at least 30. Tests which aim to confirm or to compare assumptions and models require smaller numbers of tests. At least 6 tests shall be performed for each configuration or 3 tests for simple items.

Tests, and the analysis of tests, shall be based on reference standards of EN 1995-1-1 and on harmonised product standards, so that the resulting properties are compatible with the Eurocode system, and notably with Method 1 and 2 as described in Guidance Paper L.

Method 1 and 2 are defined as follows:

- Method 1 means indication of geometrical data of the component and of properties of the materials and constituent products used.
- Method 2 means determination of properties by means of the EN Eurocodes with the results expressed as characteristic values.

Butt joints

Butt joints in the layers shall be assessed with regard to load bearing capacity and stiffness. Within one layer the butt joints shall be placed in a staggered arrangement. The ETA shall specify the distance of the butt joints between adjacent boards.

Assessment of butt joints shall be with bending and shear tests.

Hardwood dowels

The hardwood dowels shall be specified with regard to dimensions, in particular diameter, wood species, density and moisture content.

All hardwood dowels shall be graded. The grading procedure shall consider at least
- wood species
- free of significant knots
- free of abnormal direction of grain
- free of significant reaction wood, fissures, rot, mould and insect infestation

The dowels shall be traceable in batches with regard to the hardwood they are manufactured of.

The specification of the hardwood dowels shall be given in the ETA.

Additional components

Additional components like vapour barriers or building papers shall be assessed with regard to their influence on load bearing capacity and stiffness.

Assessment of additional components shall be with bending and shear tests.

2.2.1.1 Load bearing capacity and stiffness regarding mechanical actions perpendicular to the solid wood slab

General

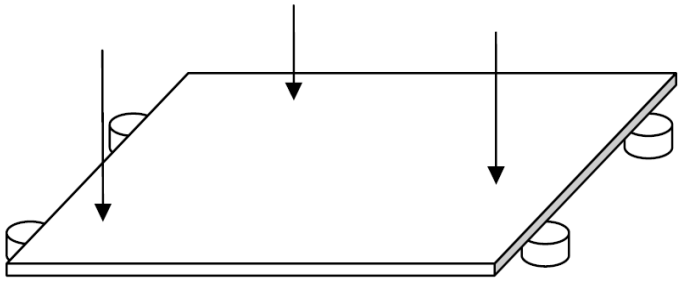


Figure 4: Loading perpendicular to the solid wood slab element – element of dowel jointed timber boards – Schematic

The solid wood slab element shall have adequate resistance and safety against structural collapse and damage disproportionate to the original cause. The following aspects of load bearing capacity and stiffness regarding mechanical actions perpendicular to the mechanically jointed solid wood slab element are relevant for the solid wood slab element.

- Performance in bending, including effects of shear
  - load-bearing capacity
  - stiffness
- Performance in compression
- Performance in tension

In general calculation assisted by testing should be applied. Alternatively all intended configurations of mechanically jointed solid wood slab element with regard to number, thickness and orientation of layers as well as number and spacing of dowels shall be tested.

Calculation for bending and shear performance

For calculation of bending stresses only layers with orientation of grain perpendicular to the vector of momentum shall be considered. Layers of inclined boards can be considered as well if the configuration of the solid wood slab element allows for their contribution. The remaining layers shall be disregarded with respect to their contribution to bending stiffness and bending strength.

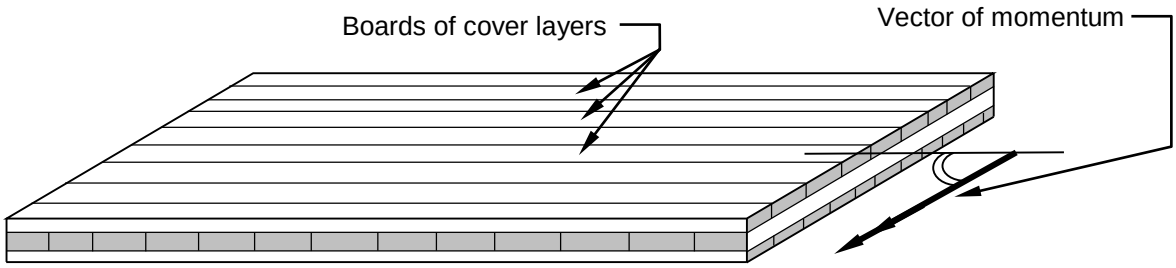


Figure 5: Vector of momentum in plane of the solid wood slab element and perpendicular to the grain of the cover layers – Schematic

For dimensions the nominal dimensions shall apply.

The mechanical characteristics of the single layers shall be taken from EN 338 according to the strength class of the boards.

Calculation shall follow EN 1995-1-1. For two or three layers with orientation of grain perpendicular to the vector of momentum EN 1995-1-1, Annex B may be applied. More than three of such layers will require numerical methods. An example of a suitable method is described in EOTA Technical Report EOTA TR019, section C.1. Further guidance on other numerical methods is given further down in EOTA TR019.

The contribution of the dowels will be considered by shear stiffness. This shear stiffness shall be determined in bending tests, evaluated with the above mentioned calculations. These tests shall be performed on specimens with layers of perpendicular orientation only, i.e. free of inclined layers.

Bending tests

Bending tests shall be performed following EN 408 observing principles as given in EN 789. Vector of momentum shall be in plane of the solid wood slab element and **perpendicular** to the grain of the cover layers.

Tests shall be performed with different configurations of mechanically jointed solid wood slab element elements, e.g. number and thicknesses of boards, thickness and spacing of dowel type fasteners. The width of the specimen shall be about 1,5 m and a length of about 5 m.

At least the following combinations shall be tested.

- two different numbers of layers
- two different orientations of intermediate layers

Vector of momentum in plane of the solid wood slab element and **parallel** to the grain of the cover boards.

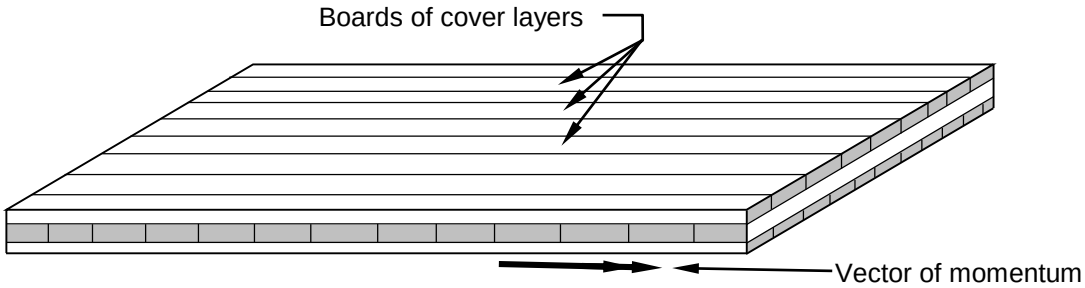


Figure 6: Vector of momentum in plane of the solid wood slab element and parallel to the grain of the cover layers – Schematic

For the calculation of the bending strength the same stiffness and strength values as for vector direction perpendicular to the grain of the cover boards shall be used. However the cross-section shall be reduced by the cover layers.

Bending tests shall follow the same principles as given above. In general testing of fewer configurations and smaller specimen are sufficient.

Bending stiffness

For the bending tests load deflections plots, both local and global, shall be recorded. Some of these tests shall include at least three loading and unloading cycles, preferably at serviceability load level with at least 30 % unloading of the applied load.

The bending stiffness $(E_m I)_{ef}$ of the slab elements shall be determined at different load levels, e.g. at serviceability load and close to ultimate load.

The load bearing capacity is defined as the ultimate moment, M_u, of the test.

Bending and shear stiffness from the tests shall be evaluated as described above.

Bending strength

Bending strength from the tests shall be evaluated as described above.

Shear tests

Shear tests shall be performed following EN 408 observing principles as given in EN 789. Vector of momentum shall be in plane of the solid wood slab element and **perpendicular** to the grain of the cover layers. The forces shall be imposed sufficient close to the supports to result in shear failure.

The specimens shall have a width of about 1 m and a span width of about 3 m.

Shear strength

Shear strength from the tests shall be evaluated as described above

Compression

Compression perpendicular to the solid wood slab shall be assessed according to EN 1995-1-1. The strength classes specified in EN 338 shall be considered.

Tension

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.

2.2.1.2 Load bearing capacity and stiffness regarding mechanical actions in plane of the solid wood slab

General

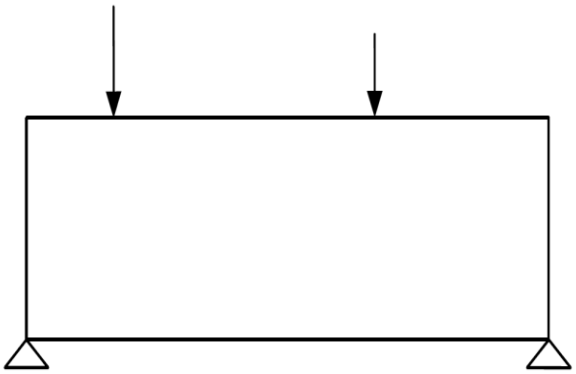


Figure 7: Loading in plane of the solid wood slab element – element of dowel jointed timber boards – Schematic

The following aspects of load bearing capacity and stiffness regarding mechanical actions in plane of the solid wood slab element are relevant for the solid wood slab

- bending stiffness
- shear stiffness
- bending strength
- compression
- buckling
- tension
- shear strength

Bending and shear

In performance calculation of stresses only layers with orientation of grain parallel to the span width shall be considered. The remaining layers shall be disregarded with respect to their contribution to stiffness and strength.

Testing is required if for strength and stiffness the contribution of the dowels and the perpendicular layers will be considered. These tests shall be performed with all configurations intended for that application of loads.

Within the works the number of rows and the edge distances of the hardwood dowels shall be specified.

Bending tests

Bending tests shall be performed following EN 408.

The depth of the beams shall be limited to about 400 mm or three rows of hardwood dowels with at least 50 mm edge distance, whichever is the largest. Each specimen shall feature a gap at about half the depth of the beam between boards running parallel to the span width and inclined layers.

Bending stiffness

For the bending tests load deflections plots, both local and global, shall be recorded. The bending stiffness $(E_m I)_{ef}$ of the slab elements shall be determined at different load levels, e.g. at serviceability load and close to ultimate load. Some of these tests shall include at least three loading and unloading cycles, preferably at serviceability load level with at least 30 % unloading of the applied load.

Bending strength

The load bearing capacity is defined as the ultimate moment, M_u, of the test.

Bending strength from the tests shall be evaluated applying $(EI)_{ef}$.

Shear tests

Shear tests shall be performed following EN 408, on specimen as defined for the bending tests above. The forces shall be imposed sufficient close to the supports to result in shear failure.

Shear strength and stiffness

Shear strength and stiffness from the tests shall be evaluated applying $(EI)_{ef}$.

Shear walls

If the mechanically jointed solid wood slab elements are intended to be used as shear walls, shear tests shall be performed following EN 594. From these tests the stiffness of the shear wall and the ultimate shear force are determined.

Essential for strength and stiffness as shear walls are layers of inclined orientation together with longitudinal and perpendicular layers. Only mechanically jointed solid wood slab elements which features such configuration shall be used as shear walls.

Testing regarding shear walls shall be with all configurations intended for that loading. The configuration shall include at least three adjacent layers with different orientations.

For the tests load deflections plots shall be recorded. Stiffness of the slab elements shall be determined at different load levels, e.g. at serviceability load and close to ultimate load. Some of these tests shall include at least three loading and unloading cycles, preferably at serviceability load level with at least 30 % unloading of the applied load.

The load bearing capacity is defined as the ultimate shear force of the test.

Compression

Load bearing capacity in compression shall be assessed according to EN 1995-1-1. The strength classes specified in EN 338 shall be applied.

Only layers loaded parallel to the grain shall be taken into account.

Buckling

Calculation assisted by testing should be applied. Calculation of stiffness shall be as described above

Compression tests shall be performed to verify the calculation. Testing shall be with at least one configuration of mechanically jointed solid wood slab elements, e.g. one number and thicknesses of boards, one thickness and spacing of dowel type fasteners. The configuration should be common to a wall element.

Length of the specimen shall be about 1,5 m and a height of about 2,8 m.

The minimum length of single construction members suitable for compression loads shall be given in the ETA. If length smaller than 1,5 m should be given, these should be verified by tests.

Tension

Tension parallel to the grain of the cover layers

Tension perpendicular to the grain of the cover layers

Load bearing capacity in tension shall be assessed according to EN 1995-1-1. The strength classes specified in EN 338 shall be applied.

Only layers loaded parallel to the grain shall be taken into account.

Description of performance

The following characteristics shall be derived from the tests or calculation procedures and stated in the ETA.

- mechanical characteristics of the timber according to the strength classes of EN 338
- mean shear stiffness of the dowels for bending when loaded perpendicular to the solid wood slab
- characteristic shear strength of the dowels for bending configuration when loaded perpendicular to the solid wood slab element
- if determined, the mean bending stiffness for beam applications when loaded in plane the solid wood slab
- if determined, the mean shear stiffness for beam applications when loaded in plane the solid wood slab
- mean shear stiffness for shear wall applications
- characteristic strength of shear wall applications

Characteristic values shall be determined in accordance with ETAG 011.

2.2.1.3 Embedment strength and withdrawal strength

Embedment strength end withdrawal strength depends on the fasteners for connecting the individual solid wood slab elements with other products.

Embedment strength

Embedment strength shall be determined according to EN 1995-1-1 with the possibility of testing.

Reference to EN 1995-1-1 or the product performance determined in accordance with EN 383 shall be given in the ETA.

Withdrawal strength

Withdrawal strength shall be determined according to EN 1995-1-1 with the possibility of testing.

Reference to EN 1995-1-1 or the product performance in accordance with EN 1382 shall be given in the ETA.

In the assessment the edges of the solid wood slab elements and the joints between the boards shall be considered. In general the edged of the individual boards shall be considered as edges for the fasteners.

2.2.1.4 Creep and duration of load

Designs of the solid wood slab element for duration of load and creep can be undertaken in accordance with EN 1995-1-1 by using the factors k_{mod} and $2,5 \cdot k_{def}$ for solid timber.

Where

k_{mod} Strength modification factor to account for duration of load. The values given in EN 1995-1-1 shall be applied.

k_{def} Deformation modification factor to account for duration of load. The values given in EN 1995-1-1 shall be applied.

The coefficients shall be given in the ETA

2.2.1.5 Dimensional stability

Tolerances of dimensions

The tolerances of the solid wood slab element – element of dowel jointed timber boards shall be stated in the ETA. The tolerances shall ensure the performance and stability of the boards.

Stability of dimensions

An assessment shall be made of the effect on the solid wood slab element dimensions of variations in moisture content between installation and service as well as during the solid wood slab element's service life.

The dimensional changes due to varying moisture content shall not have inadmissible effects on its performance and stability.

Gaps between the boards within one layer shall be assessed with regard to moisture changes.

Thermal expansion

Thermal expansion is governed by the thermal expansion coefficient. For timber structures in buildings, thermal expansion is normally not relevant, as it interferes with much larger moisture effects.

Numeric values of the nominal dimensions and tolerances, e.g. on length, width and depth, shall be given in the ETA.

The effect of different moisture conditions on the nominal dimensions shall be given in the ETA. The highest moisture condition for the intended use of the product shall be specified.

2.2.1.6 Design

With reference to design documents of the works or client's order (according to Guidance Paper L, Method 3) the following sub-cases are relevant:

Method 3a: For cases in which a structural component or kit is produced in accordance with the design details (drawings, material specifications, etc.) prepared by the designer of the works [1] following the National Provisions, component hENs or ETAs shall provide, where relevant, that the information to accompany the CE marking with regard to the product properties can be given by making reference, in an unambiguous way, to the respective design documents of the works.

Method 3b: For cases in which the producer has designed and produced a structural component or kit following the provisions of the client's order, in accordance with the national provisions applicable to the works, the component hEN or ETA shall provide, where relevant, that the information to accompany the CE marking with regard to the product properties can be given by making reference, in an unambiguous way, to the drawings and material specifications linked to the client's order.

The design of the works which results in the design documentation made available by the purchaser shall be based on the performances given in the ETA. These are the characteristics as given in clause 2.2.1. Therefore no special methods of verification are required for Method 3a.

NOTE During ongoing manufacturing the manufacturer shall verify that sufficient information is provided in the design documentation to manufacture the solid wood slab elements, taking account of the performance characteristics given in the ETA.

The design of the works which results in the design documentation prepared by the manufacturer shall be based on the performances given in the ETA. These are the characteristics as given in clauses 2.2.1. to 2.2.10. Therefore no special methods of verification are required for Method 3b.

NOTE During ongoing manufacturing the manufacturer shall verify that sufficient information is provided in the design documentation to manufacture the solid wood slab elements, taking account of the performance characteristics given in the ETA. See clause 3.2.2.1.5 for further information on implications of Method 3b during production.

As no specific verification is required, there are no further methods of assessment for Methods 3a and 3b.

1 or the designer of the concerned part of the works

2.2.2 Reaction to fire

The mechanically jointed solid wood slab elements shall be tested with the required test methods in order to be classified according to EN 13501-1.

The specimen for the test according to EN 13823 shall have at least 3 layers of boards, jointed with hardwood dowels arranged in a regular grid. The maximum thickness of the specimen is 200 mm. On the trolley the specimen shall be installed without any backing.

The first layer of boards, which is the surface exposed to the fire, shall have vertical boards. The width of the joints between the boards shall be maximum 5 mm. 200 mm away from the inner corner a vertical gap between the boards of at least 10 mm shall be provided. The second layer of boards shall be arranged horizontally. The width of the joints between the boards shall be maximum 5 mm. There shall be a vapour barrier or building paper between the first and the second layer of boards.

The subsequent layers of boards shall be alternating vertically and horizontally. The width of the joints between the boards shall be maximum 5 mm.

The product classification in accordance with EN 13501-1 shall be given in the ETA.

2.2.3 Resistance to fire

Relevant for Methods 1 and 2 (see clause 2.2, General):

The resistance to fire performance shall be classified in accordance with EN 13501-2 based on the relevant test methods.

The product classification in accordance to EN 13501-2 shall be given in the ETA.

Relevant for Method 3 (see clause 2.2.1.6):

No special assessment is required for Method 3. The manufacturer shall verify that sufficient information is provided in the design documentation to manufacture the solid wood slab elements, taking account of the performance characteristics given in the ETA.

2.2.4 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 manufacturer using the methods and criteria described in EOTA TR 034.

2.2.5 Water vapour permeability

It shall be established by calculation that condensation inside the works as a result of water vapour diffusion will not occur, or will occur only to an extent where no damage is caused during condensation period and that the work will dry out again during the evaporation period. The calculation shall follow EN ISO 13788.

Design values of material characteristics may be taken from EN ISO 10456. Water vapour transmission characteristics can be determined, if deemed necessary, in accordance with EN 12086.

The material characteristic shall be stated in the ETA. The results of the calculation shall be given for typical configurations.

2.2.6 Airborne sound insulation

Testing shall be performed as described in EN ISO 10140-2.

The result shall be expressed as a single number rating in accordance with EN ISO 717-1.

2.2.7 Impact sound insulation

Testing shall be performed as described in EN ISO 10140-3.

The result shall be expressed as a single number rating in accordance with EN ISO 717-2.

2.2.8 Sound absorption

Sound absorption is only relevant when the solid wood slab element is used as an internal finish. Testing shall be performed as described in EN ISO 354.

The result shall be expressed as a single number rating in accordance with EN ISO 11654.

2.2.9 Thermal resistance

- Relevant parameters for the performance are thickness of the solid wood slab element;
- Thermal conductivity of the solid wood slab.

Design values of material properties may be taken from EN ISO 10456. As an alternative, thermal conductivity shall be determined according to EN 12664. Thermal resistance shall be calculated as given in EN ISO 6946.

The material properties in accordance with EN ISO 10456, or measured according to EN 12664 or the thermal resistance according to EN ISO 6946 shall be given in the ETA.

2.2.10 Air tightness

Air tightness shall be tested as given in EN 12114.

The product classification in accordance with EN 12114 shall be given in the ETA.

2.2.11 Thermal inertia

Thermal inertia is determined by calculation as part of the design of works. Design values of material properties may be taken from EN ISO 10456.

For the purpose of thermal inertia calculations, the following information shall be given in the ETA.

- design
- density of materials
- heat capacity of materials
- thermal conductivity of the materials

2.2.12 Durability

To ensure an adequately durable structure, the following interrelated factors shall be considered:

- design of works;
- account for protection of the solid wood slab elements in service.

The service classes according to EN 1995-1-1 generally describe the environmental conditions.

The use conditions for which the product is intended should be determined from the service classes according to EN 1995-1-1.

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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, amended by Decision 2001/596/EC

The systems are: **1** and **2+**

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of wood slab element in the procedure of assessment and verification of constancy of performance are laid down in Table 2.

Table 2 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)					
1	Visual inspection of mechanically jointed solid wood slab elements	1)	1)	100 %	—
2	The dimensions of the solid wood slab element are to be checked and the measured values assessed for compliance with drawings supplied by the manufacturer and with the specified tolerances	1)	1)	100 %	—
3	Visual inspection of dowels	1)	1)	5 %	per batch
4	Testing of dowels for dimensions, moisture content, density	1)	1)	1 %, at least 5 dowels	per batch
5	Bending test on dowels	2)	1)	5	per batch

1) According to the specification and configuration of the mechanically jointed solid wood slab elements and their components

2) 3 point bending test

3.3 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 wood slab element are laid down in Table 3.

Table 3 Control plan for the notified body; cornerstones

No	Subject/type of control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or control method *(refer to 2.2 or 3.4)*	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	The notified body shall ascertain that, in accordance with the control plan, the manufacturing plant of the product manufacturer, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the mechanically jointed solid wood slab elements according the ETA. See clause 2.2.1 for particular items regarding BWR1.				
Continuous surveillance, assessment and evaluation of factory production control					
2	It shall be verified that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan. See clause 2.2.1 for particular items regarding BWR1.				

3.4 Special methods of control and testing used for the verification of constancy of performance

The method used in 2.2.1 will have an influence on the tasks of the manufacturer and the notified body in regards to the AVCP procedure.

3.4.1 Initial inspection of factory and factory production control

The following clauses details tasks of the manufacturer and the approved body regarding methods 1 to 3b of section 2.2.1. These clauses are not intended to supersede the ETA and the control plan.

3.4.1.2 Method 1

The manufacturer declares geometrical data e.g. overall dimensions of the solid wood slab element, thickness of boards, number, orientation and sequence of layers, pattern of hard wood dowels etc.. The properties of the materials and constituent products are given in the ETA and the manufacturer has to declare conformity therewith.

Design of works is done by someone else according to the ETA and does not fall under the responsibility of the manufacturer.

During the initial inspection of the factory and of factory production control, the approved body evaluates that the methods of factory production control are sufficient with regard to determination of geometrical data of the components and of properties of the materials and constituent products necessary as input for calculations and these are in conformity with the ETA. The approved body further checks, that the manufacturer has procedures in place to ensure that appropriate materials and component are used in manufacturing the solid wood slab element.

3.4.1.3 Method 2

The manufacturer declares structural performance of the solid wood slab element, expressed as characteristic or design values. Determination of structural performance is done by the manufacturer

or on behalf of the manufacturer according to the ETA. In cases where the manufacturer declares structural performance of the solid wood slab element as design values, the manufacturer has to be aware of the correct nationally determined parameters in force at the place of use. Determination of structural performance of the solid wood slab element falls under the responsibility of the manufacturer.

Design of works is done by someone else according to the ETA and does not fall under the responsibility of the manufacturer.

During the initial inspection of the factory and of factory production control, the approved body evaluates that the methods of factory production control are sufficient with regard to determination of geometrical data of the components and of properties of the materials and constituent products necessary as input for calculations and these are in conformity with the ETA. Regarding determination of structural performance of the solid wood slab element the approved body evaluates the procedures of the manufacturer to determine the structural performance. In particular the procedure to establish the nationally determined parameters in force at the place of use shall be verified by the approved body. The approved body further checks, that the manufacturer has procedures in place to ensure that appropriate materials and component are used in manufacturing the solid wood slab element.

3.4.1.4 Method 3a

The manufacturer declares conformity to design documents of the purchaser.

Design of works is done by someone else according to the ETA and does not fall under the responsibility of the manufacturer.

During the initial inspection of the factory and of factory production control, the approved body evaluates that the methods of factory production control are sufficient with regard to determination of geometrical data of the components and of properties of the materials and constituent products necessary as input for calculations and these are in conformity with the ETA. Regarding the design documents presented by the purchaser, the approved body evaluates the procedures of the manufacturer to determine the structural performance of the solid wood slab element to be in conformity with the ETA. The approved body further checks, that the manufacturer has procedures in place to ensure that appropriate materials and component are used in manufacturing the solid wood slab element.

3.4.1.5 Method 3b

The manufacturer declares conformity to design documents produced and held by the manufacturer according to an order for the works. Determination of structural performance of the solid wood slab element is done by the manufacturer or on behalf of the manufacturer according to the ETA. The manufacturer has to be aware of the correct nationally determined parameters in force at the place of use. Determination of structural performance of the solid wood slab element falls under the responsibility of the manufacturer.

Design of works is done by the manufacturer or on behalf of the manufacturer according to the ETA and falls under the responsibility of the manufacturer but does not fall under the scope of the CPR rather than under the scope of a different legislation in force at the place of use.

During the initial inspection of the factory and of factory production control, the approved body evaluates that the methods of factory production control are sufficient with regard to determination of geometrical data of the components and of properties of the materials and constituent products necessary as input for calculations and these are in conformity with the ETA. Regarding determination of structural performance of the solid wood slab element the approved body evaluates the procedures of the manufacturer to determine the structural performance of the solid wood slab element. In particular the procedure to establish the nationally determined parameters in force at the place of use shall be verified by the approved body. The approved body further checks, that the manufacturer has procedures in place to ensure that appropriate materials and component are used in manufacturing the solid wood slab element.

NOTE Design of works does not fall under the scope of the Regulation (EU) No 305/2011 and the notified body does not have any responsibility thereof.

3.4.2 Continuous surveillance, judgement and assessment of factory production control

3.4.2.1 Method 1

The manufacturer declares geometrical data e.g. overall dimensions of the solid wood slab element, thickness of boards, number, orientation and sequence of layers, pattern of hard wood dowels etc. The properties of the materials and constituent products are given in the ETA and the manufacturer has to declare conformity therewith.

Design of works is done by someone else according to the ETA and does not fall under the responsibility of the manufacturer.

During continuous surveillance, assessment and Assessment of factory production control, the approved body checks at each inspection that the manufacturer follows the procedures established during the initial inspection and evaluate conformity with the ETA.

3.4.2.3 Method 2

The manufacturer declares structural performance of the solid wood slab element, expressed as characteristic or design values. Determination of structural performance is done by the manufacturer or on behalf of the manufacturer according to the ETA. In cases where the manufacturer declares structural performance of the solid wood slab element as design values, the manufacturer has to be aware of the correct nationally determined parameters in force at the place of use. Determination of structural performance of the solid wood slab element falls under the responsibility of the manufacturer.

Design of works is done by someone else according to the ETA and does not fall under the responsibility of the manufacturer.

During continuous surveillance, assessment and approval of factory production control, the approved body checks at each inspection that the manufacturer follows the procedures established during the initial inspection and evaluate conformity with the ETA.

3.4.2.4 Method 3a

The manufacturer declares conformity to design documents of the purchaser.

Design of works is done by someone else according to the ETA and does not fall under the responsibility of the manufacturer.

During continuous surveillance, assessment and approval of factory production control, the approved body checks at each inspection that the manufacturer follows the procedures established during the initial inspection and evaluate conformity with the ETA.

3.4.2.5 Method 3b

The manufacturer declares conformity to design documents produced and held by the manufacturer according to an order for the works. Determination of structural performance of the solid wood slab element is done by the manufacturer or on behalf of the manufacturer according to the ETA. The manufacturer has to be aware of the correct nationally determined parameters in force at the place of use. Determination of structural performance of the solid wood slab element falls under the responsibility of the manufacturer.

Design of works is done by the manufacturer or on behalf of the manufacturer according to the ETA and falls under the responsibility of the manufacturer but does not fall under the scope of the CPR rather than under the scope of a different legislation.

During continuous surveillance, assessment and approval of factory production control, the approved body checks at each inspection that the manufacturer follows the procedures established during the initial inspection and evaluate conformity with the ETA.

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.

ETAG 011	Light composite wood-based beams and columns
EOTA TR 019	Calculation models for prefabricated wood-based loadbearing stressed skin panels for use in roofs
EOTA TR 034	General BWR 3 Checklist for EADs/ETAs – Content of dangerous substances in construction products/kits
Guidance Paper L	Guidance Paper L concerning the Construction Products Directive - 89/106/EEC, Application and Use of Eurocodes
EN 336:2013	Structural timber – Sizes, permitted deviations
EN 338:2009	Structural timber – Strength classes
EN 383:2007	Timber structures – Test methods – Determination of embedment strength and foundation values for dowel type fasteners
EN 408:2012	Timber structures – Structural timber and glued laminated timber – Determination of some physical and mechanical properties
EN 594:2011	Timber structures – Test methods – Racking strength and stiffness of timber frame wall panels
EN 789:2004	Timber structures – Test methods – Determination of mechanical properties of wood based panels
EN 1382:2000	Timber structures – Test methods – Withdrawal capacity of timber fasteners
EN 1990:2006	Eurocode – Basis of structural design
EN 1995-1-1:2008	Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings
EN 12086:2013	Thermal insulating products for building applications - Determination of water vapour transmission properties
EN 12114:2008	Thermal performances of buildings - Air permeability of building components and building elements - Laboratory test method
EN 12664:2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance
EN 13501-1+A1:2009	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN 13501-2+A1:2009	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13823:2010	Reaction to fire tests for building products. Building products excluding floorings exposed to the thermal attack by a single burning item
EN 14081-1:2011	Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements
EN ISO 10140-2:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation

EN ISO 10140-3:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation
EN ISO 354:2003	Acoustics - Measurement of sound absorption in a reverberation room
EN ISO 717-1:2013	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation
EN ISO 717-2:2013	Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation
EN ISO 6946:2008	Building components and building elements - Thermal resistance and thermal transmittance - Calculation method
EN ISO 11654:1997	Acoustics - Sound absorbers for use in buildings - Rating of sound absorption
EN ISO 10456:2010	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values
EN ISO 13788:2013	Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation method