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European Assessment Document for

# Prefabricated wood slabs of milled softwood timber to be used as structural elements 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) 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

The prefabricated wood slabs of milled softwood timber to be used as structural elements in buildings (in the following referred to as prefabricated wood slabs) is made of parallel arranged softwood timber members with grooves milled from the faces. They are provided with a tongue and groove milling at the faces and connected together with dowel-type fasteners made of hardwood in order to form a slab, see Figure 1.1.1a.

The geometry of dowel-type fasteners is shown in Figure 1.1.2. They may be arranged perpendicular to the grain or inclined, see Figure 1.1.3.

The prefabricated wood slabs can be produced as one-part, two-part or three-part structure whereas the load bearing function is assigned to every single part. Examples for a one-part structure and a two-part structure are shown in Figure 1.1.1a and 1.1.1b. In case of two- or three-part prefabricated wood slabs, every second softwood timber member is varied in height in order to obtain interlocking between the single prefabricated wood slab parts (in the following referred to as staggered joint), see Figure 1.1.1b. This joint does not represent a shear resistant connection.

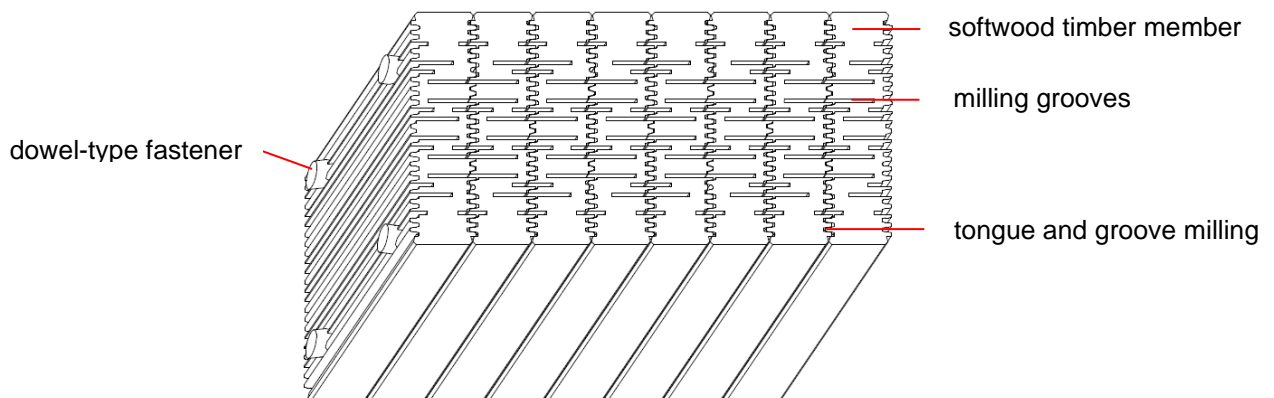
Cross sections and geometry of the softwood timber members with grooves and tongue and groove milling are shown in Figure 1.1.4.

This EAD covers prefabricated wood slabs made from one of the following species:

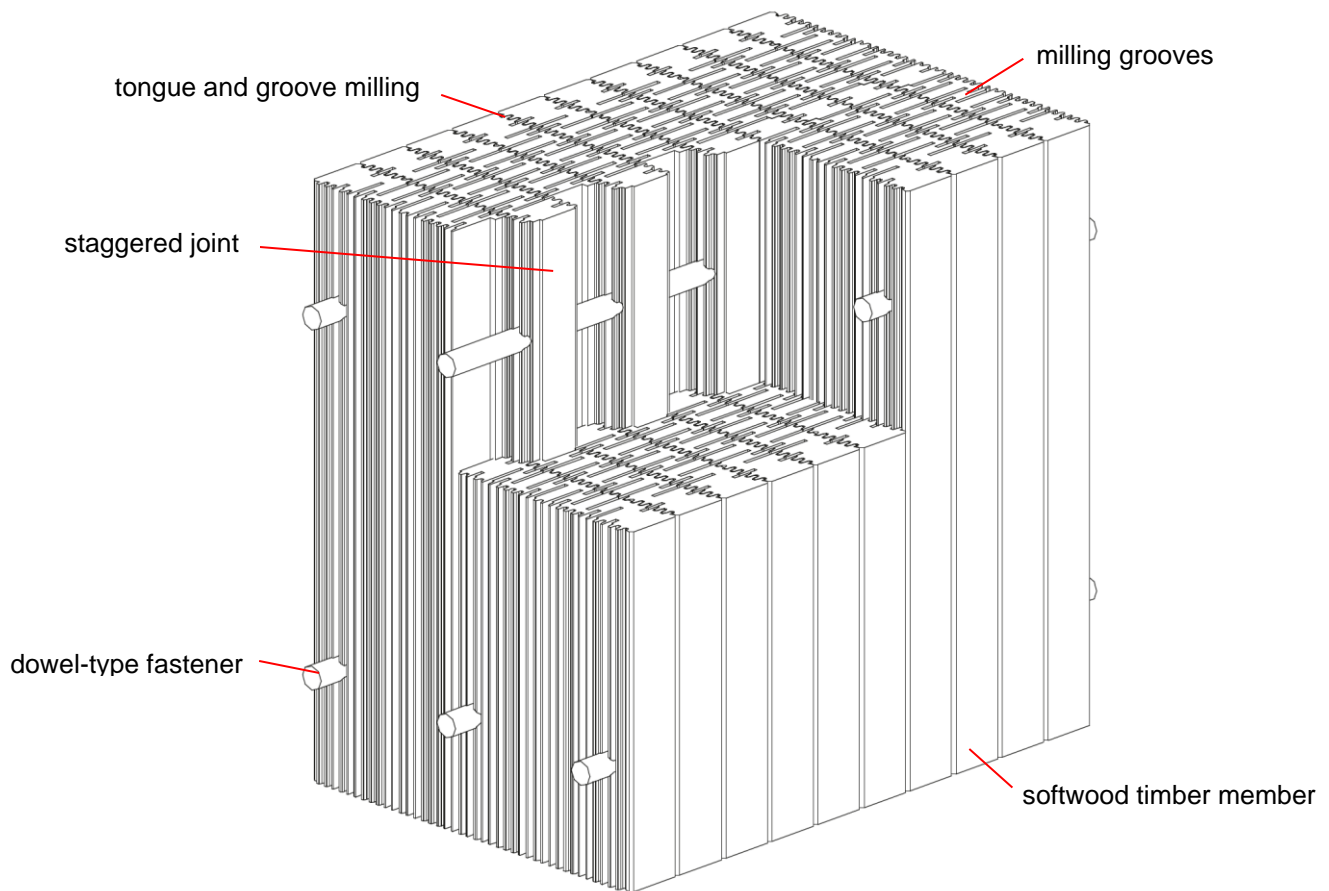
Norway spruce (*Picea abies*, PCAB), Silver fir (*Abies alba*, ABAL), Scots pine (*Pinus sylvestris*, PNSY).

Norway spruce and Silver fir may be considered as one species.

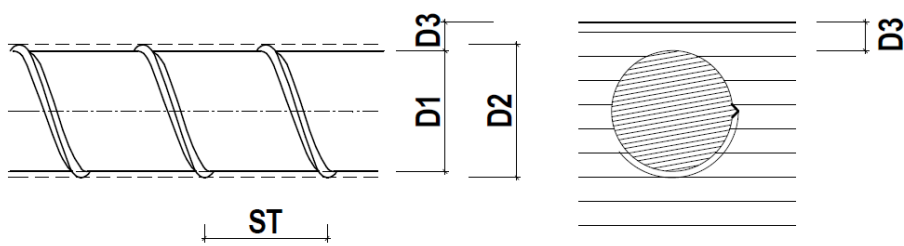
**Figure 1.1.1a: Principle structure of the prefabricated wood slabs for floors, roofs and walls (one-part structure)**



**Figure 1.1.1b: Principle structure of the prefabricated wood slabs for walls (two-part structure)**



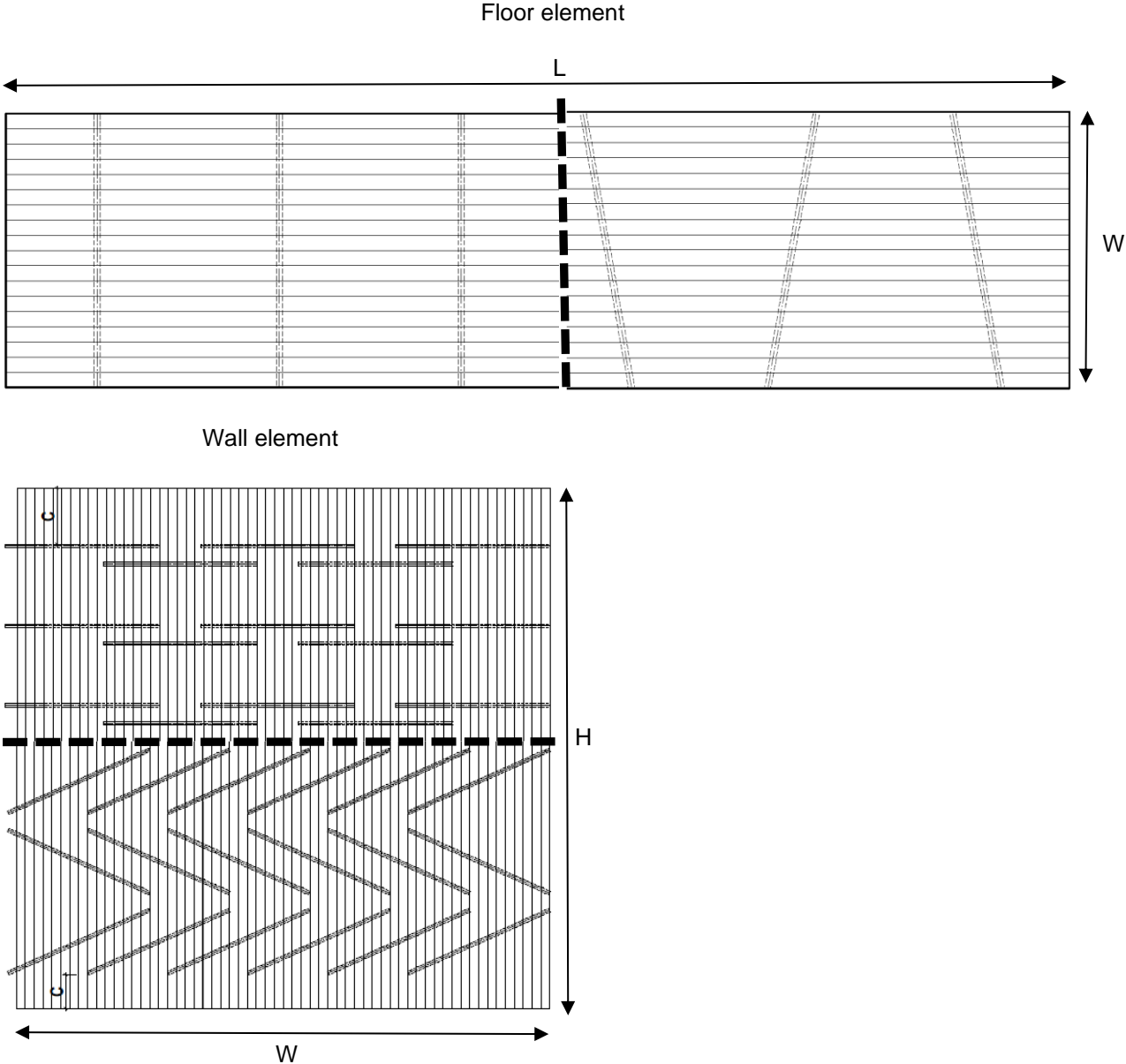
**Figure 1.1.2: Geometry of dowel-type fasteners made of hardwood**



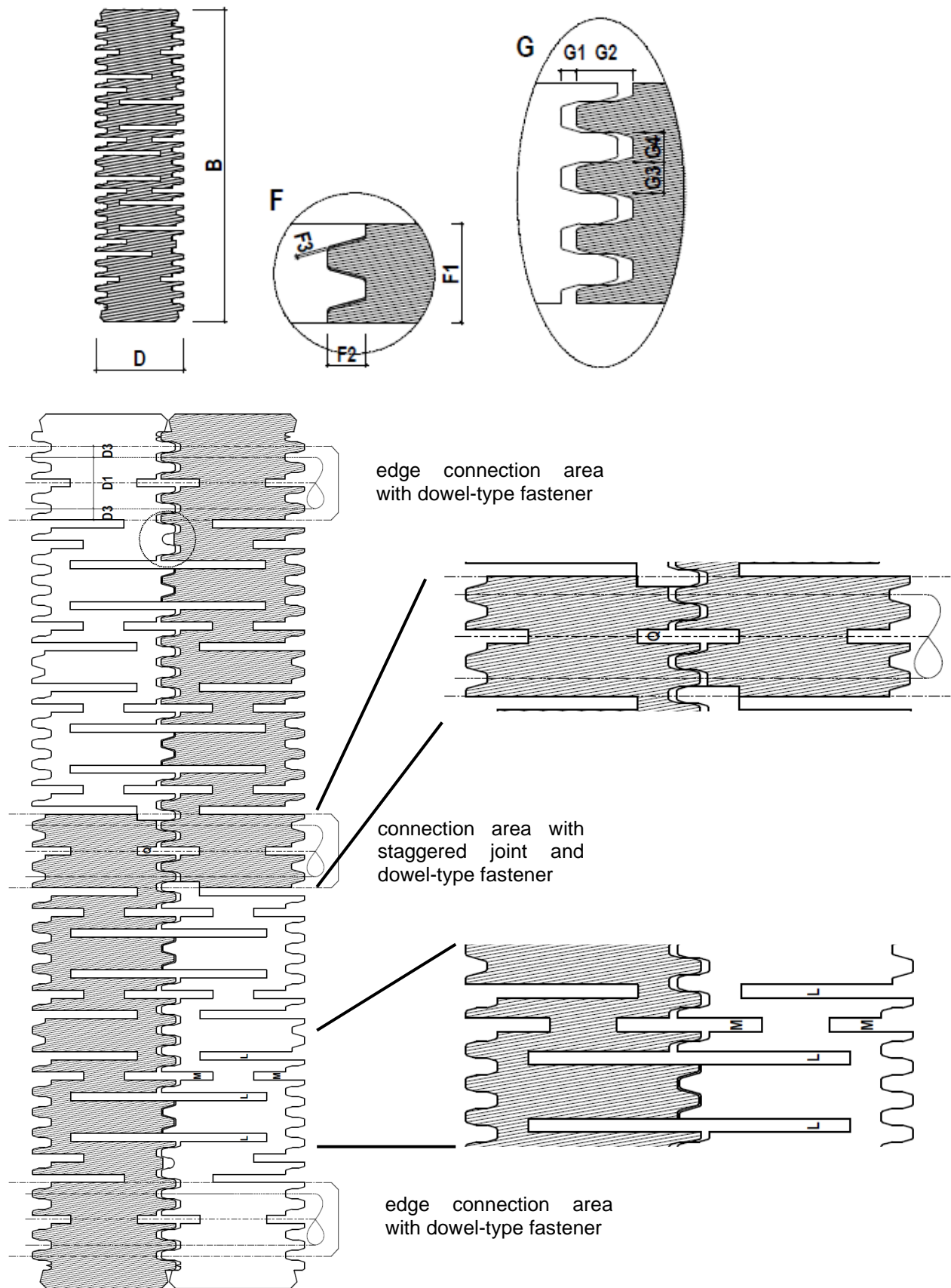
**Table 1.1.1: Geometry of dowel-type fasteners with thread**

Dowel-type fasteners with thread	
Length of dowels	800 to 1500 mm
Inner diameter D1	15 to 30 mm
Outer diameter D2	D1 +0,5 to 2,0 mm
Edge distance D3	minimum 4 mm
Pitch ST	0,3 to 3 D1

Figure 1.1.3: Examples for prefabricated wood slabs used as floor and wall elements (dowel arrangement perpendicular to the grain or inclined)



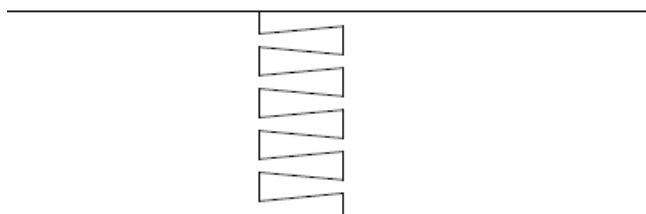
**Figure 1.1.4: Cross section and geometry of the softwood timber members, possible variant F (non-flexible) and G (flexible) for tongue and groove milling and exemplary cross section of wall element (two-part structure)**



**Table 1.1.2: Geometry of the prefabricated wood slabs**

Type of prefabricated wood slabs	Floor/Roof	Wall		
	one-part	one-part	two-part	three-part
Maximum length L / maximum height H	9 000 mm	4 500 mm		
Maximum width W	1 500 mm	3 000 mm		
Number of dowel rows	1 or 2	1 or 2	2 or 3	3 or 4
Angle for inclined dowel arrangement	10° to 30°	20° to 35°		
Edge distance C (indicated in Figure 1.1.3)	50 mm	70 mm		
Distance between dowel rows	400 to 800 mm			
Height of softwood timber member B	100 to 320 mm			
Thickness of softwood timber member D	30 to 85 mm			
Maximum height of prefabricated wood slabs	320 mm	320 mm	400 mm	530 mm
Overlapping at staggered joint	–	–	minimum D1+2 D3	
Width of milling	2 to 5 mm			
Minimum length of milling L / M / Q	10 mm			

The softwood timber members may be provided by a glueless finger joints with a geometry according to Figure 1.1.5.

**Figure 1.1.5: Exemplary geometry of glueless finger joint**

#### Dowel-type fasteners

The dowel-type fasteners are made of hardwood with a minimum density of 600 kg/m<sup>3</sup>.

The dowel-type fasteners are specified with regard to dimensions, in particular diameter, wood species, density and moisture content. All dowel-type fasteners are graded with a grading procedure considering 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 European Assessment Document does not cover connections between two prefabricated wood slabs or between the prefabricated wood slabs and other parts of the building.

The European Assessment Document does not cover prefabricated wood slabs:

- made from softwood timber members treated with flame retardants or wood preservatives,
- made from recycled softwood timber members.

The product is not covered by a harmonised European standard (hEN).



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.

NOTE: For fixing of objects the edges of the softwood timber members shall be considered as edges for the fasteners. For tensile loads perpendicular to the prefabricated wood slabs sufficient load distribution must be ensured.

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 to construct walls (one- to three-part structure), floors and roofs (one-part structure).

The prefabricated wood slabs shall be subjected to static and quasi static actions only.

The prefabricated wood slabs are intended to be used in service classes 1 and 2 according to EN 1995-1-1<sup>1</sup>.

The prefabricated wood slabs shall not be subjected to tensile loads acting perpendicular to the prefabricated wood slabs.

Within a roof construction, the prefabricated wood slabs will not contribute to the water tightness, but will receive a suitable waterproofing and roof covering. Waterproofing and roof covering are not subject of EAD.

### 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 slabs 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 works<sup>2</sup>.

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.

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<sup>1</sup> All undated references to standards or to EADs in this EAD are to be understood as references to the dated versions listed in chapter 4.

<sup>2</sup> 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.

## **1.3 Specific terms used in this EAD**

### **1.3.1 Glueless finger joint**

Interlocking end joint formed by machining a number of similar, tapered fingers in the ends of softwood timber members using a special finger joint cutter.

### **1.3.2 Dowel-type fasteners**

Dowel-type fasteners made of hardwood with a minimum density of 600 kg/m<sup>3</sup> for connecting the softwood timber members.

The dowel-type fasteners are specified with regard to dimensions, in particular diameter, wood species, density and moisture content. All dowel-type fasteners are graded and free of significant knots, free of abnormal direction of grain, free of significant reaction wood, fissures, rot, mould and insect infestation.

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the prefabricated wood slabs is assessed in relation to the essential characteristics.

**Table 2.1.1 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	Type of expression of product performance
<b>Basic Works Requirement 1: Mechanical resistance and stability</b>			
1	Bending strength and stiffness	2.2.1	Level $f_{m,0,k}$ , $E_{m,l,0,mean}$ $f_{m,90,k}$ , $E_{m,l,90,mean}$
2	Compressive strength	2.2.2	Level $f_{c,0,k}$ $f_{c,90,k}$
3	Tensile strength of the single member	2.2.3	Level $f_{t,0,k}$
4	Racking strength and stiffness for wall elements	2.2.4	Level $F_{max}$ , $R$
5	Shear strength for floor/roof elements	2.2.5	Level $f_{v,90,k}$
6	Dimensional stability	2.2.6	Level $\beta_{max}$ , $\beta_n$ $\alpha$ and $q$
<b>Basic Works Requirement 2: Safety in case of fire</b>			
7	Reaction to fire	2.2.7	Class
8	Resistance to fire	2.2.8	Class
<b>Basic Works Requirement 3: Hygiene, health and the environment</b>			
9	Water vapour permeability – Water vapour transmission	2.2.9	Level $\mu$
<b>Basic Works Requirement 5: Protection against noise</b>			
10	Airborne sound insulation	2.2.10	Level $R_w$ (C; $C_{tr}$ )
11	Impact sound insulation	2.2.11	Level $L_{n,w}$ (Ci)
12	Sound absorption	2.2.12	Level $\alpha_s$
<b>Basic Works Requirement 6: Energy economy and heat retention</b>			
13	Thermal resistance	2.2.13	Level $R$ , $\lambda$
14	Air permeability	2.2.14	Class
15	Thermal inertia	2.2.15	Level $c_p$
<b>Aspects of durability</b>			
16	Natural durability of wood	2.2.16	Class

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

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

### 2.2.1 Bending strength and stiffness

#### *Purpose of the assessment*

Determination of bending strength and stiffness regarding mechanical actions in plane and perpendicular to the plane of the prefabricated wood slabs.

#### *Assessment method*

##### Mechanical actions in plane of the prefabricated wood slabs (flatwise bending of the softwood timber members)

Bending strength shall be tested according to EN 408, Clause 19. The height  $h$  of the specimens shall be at least the height of 3 softwood timber members. The vector of momentum shall be perpendicular to the plane of the prefabricated wood slabs and parallel to the grain of the members. Local deformations shall be measured on the bending test specimens according to EN 408, Clause 9. For orientation of softwood timber members and finger joints see EAD 130320-00-0304, Figure 2.1. The finger joints shall be randomly distributed. At least every third tested specimen shall comprise at least one finger joint in the outer lamination at the tension zone of the cross-section within the area of constant bending moment.

At least 10 tests shall be conducted. The test specimens shall be conditioned to constant mass and moisture content in an atmosphere having a relative humidity of  $65\pm 5\%$  and a temperature of  $20\pm 2^\circ\text{C}$ . In addition, the moisture content and density of the specimens shall be determined according to EN 408, Clause 6 and Clause 7.

Bending strength and modulus of elasticity shall be evaluated according to EN 408, Clause 19 and Clause 9. Mean and characteristic values shall be calculated according to EN 14358, Clause 3, logarithmically normally distributed.

##### Mechanical actions perpendicular to the prefabricated wood slabs (edgewise bending of the softwood timber members)

Bending strength shall be tested according to EN 408, Clause 19. The height  $h$  is defined by the height of the prefabricated wood slabs. The width  $w$  of the specimen shall be of smallest cross-sectional size or 600 mm. The vector of momentum shall be in plane of the prefabricated wood slabs and perpendicular to the grain of the members. Local deformations shall be measured on the bending test specimens according to EN 408, Clause 9. For orientation of softwood timber members and finger joints see EAD 130320-00-0304, Figure 2.2. The finger joints shall be randomly distributed.

At least 10 tests shall be conducted. The test specimens shall be conditioned to constant mass and moisture content in an atmosphere having a relative humidity of  $65\pm 5\%$  and a temperature of  $20\pm 2^\circ\text{C}$ . In addition, the moisture content and density of the specimens shall be determined according to EN 408, Clause 6 and Clause 7.

Bending strength and modulus of elasticity shall be evaluated according to EN 408, Clause 19 and Clause 9. Mean and characteristic values shall be calculated according to EN 14358, Clause 3, logarithmically normally distributed.

### Expression of results

#### Mechanical actions in plane of the prefabricated wood slabs:

Bending strength  $f_{m,0,k}$  as well as local modulus of elasticity  $E_{m,l,0,mean}$  shall be stated in the ETA in MPa. In case of finger joints the minimum distance of the finger joints between adjacent members shall be stated in the ETA.

#### Mechanical actions perpendicular to the prefabricated wood slabs:

Bending strength  $f_{m,90,k}$  as well as local modulus of elasticity  $E_{m,l,90,mean}$  shall be stated in the ETA in MPa. In case of finger joints the minimum distance of the finger joints between adjacent members shall be stated in the ETA.

## **2.2.2 Compressive strength**

### Purpose of the assessment

Determination of compressive strength regarding mechanical actions in plane and perpendicular to the plane of the prefabricated wood slabs.

### Assessment method

Compressive strength in plane of the prefabricated wood slab (in direction of grain) shall be tested according to EN 408, Clause 15. Hereby, specimen from single softwood timber member with a medium cross-section (minimum 2/3 of the maximum depth and width) and the highest possible number of milled grooves and highest number of holes for dowel-type fasteners shall be tested without finger joints.

Compressive strength perpendicular to the plane of the prefabricated wood slabs shall be tested according to EN 408, Clause 16. Hereby, specimen from single softwood timber member with a cross section  $b \times h \times l = 45 \times 130 \times 70$  mm with the highest possible number of milled grooves shall be tested without dowel-type fasteners and finger joints.

At least 10 tests shall be conducted. The test specimens shall be conditioned to constant mass and moisture content in an atmosphere having a relative humidity of  $65 \pm 5\%$  and a temperature of  $20 \pm 2^\circ\text{C}$ . In addition, the moisture content and density of the specimens shall be determined according to EN 408, Clause 6 and Clause 7.

Compressive strength shall be evaluated according to EN 408, Clause 15 and Clause 16. The characteristic values shall be calculated according to EN 14358, Clause 3, logarithmically normally distributed.

### Expression of results

Compressive strength  $f_{c,0,k}$  and  $f_{c,90,k}$  shall be stated in the ETA in MPa.

## **2.2.3 Tensile strength of the single member**

### Purpose of the assessment

Determination of tensile strength regarding mechanical actions in plane of the prefabricated wood slabs (in direction of grain).

### Assessment method

Tensile strength in in plane of the prefabricated wood slabs (in direction of grain) shall be tested according to EN 408, Clause 13. Hereby, specimen from single softwood timber member with a medium cross-section (minimum 2/3 of the maximum depth and width) and the highest possible number of milled grooves and highest number of holes for dowel-type fasteners shall be tested without finger joints.

At least 10 tests shall be conducted. The test specimens shall be conditioned to constant mass and moisture content in an atmosphere having a relative humidity of  $65 \pm 5\%$  and a temperature of  $20 \pm 2^\circ\text{C}$ . In addition, the moisture content and density of the specimens shall be determined according to EN 408, Clause 6 and Clause 7.

When the softwood timber member comprises finger joints, additional tests shall be performed with the joint arranged in the middle of the span.

Tensile strength shall be evaluated according to EN 408, Clause 13. The characteristic values shall be calculated according to EN 14358, Clause 3, logarithmically normally distributed.

#### Expression of results

Tensile strength  $f_{t,0,k}$  shall be stated in the ETA in MPa.

## 2.2.4 Racking strength and stiffness for wall elements

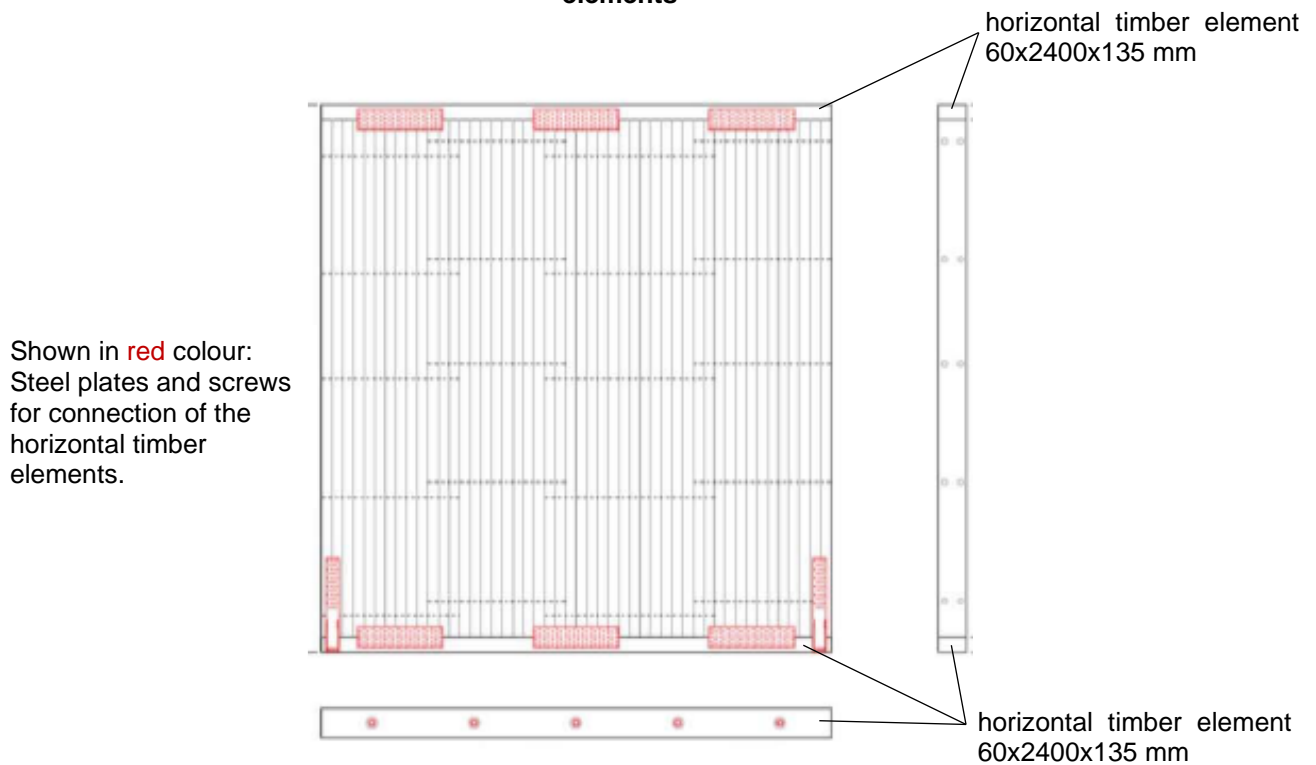
### Purpose of the assessment

Determination of racking strength and stiffness for wall elements.

### Assessment method

The racking strength and racking stiffness shall be tested according to EN 594. The number of specimens is at least 2 per wall element. Test results shall be evaluated according to EN 594. The test configuration is specified in the following:

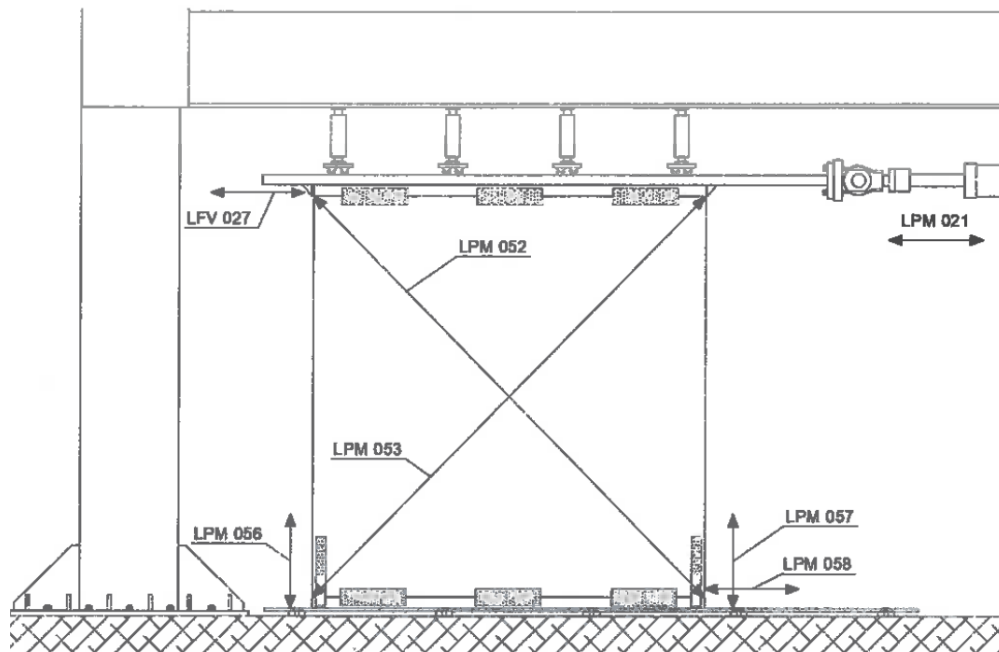
**Figure 2.2.4.1: Test configuration for determination of racking strength and stiffness for wall elements**



The wall of prefabricated wood slabs is provided with horizontal timber elements (60x2400x135 mm) at the top and bottom. These timber elements are connected to the wall by steel plates and screws.

Load is applied at the upper corner of the specimen. Deformations are measured via linear variable displacement transducers (LVDTs).

**Figure 2.2.4.2: Test configuration for determination of racking strength and stiffness – load application and placement of LVDTs**



Legend for deformation measurement via LVDTs in Figure 2.2.4.2:

- LFV027 horizontal displacement at the top of the wall
- LPM021 horizontal displacement of the hydraulic jack's head
- LPM052 diagonal displacement during horizontal loading
- LPM053 diagonal displacement
- LPM056 vertical uplift of the wall
- LPM057 vertical uplift of the wall
- LPM058 horizontal displacement at the bottom of the wall

### Expression of results

Mean racking strength  $F_{max}$  in N and mean racking stiffness  $R$  in N/mm shall be stated in the ETA together with the boundary conditions:

- vertical loads  $F_v$  and total vertical load during testing
- description and geometry of the wall element
- designation of fasteners, and
- spacing of fasteners.

## **2.2.5 Shear strength for floor/roof elements**

### Purpose of the assessment

Determination of shear strength for floor/roof elements.

### Assessment method

Shear strength shall be tested according to EN 408, Clause 19. The height  $h$  is defined by the height of the prefabricated wood slabs. The width  $w$  of the specimen shall be of smallest cross-sectional size or 600 mm. The vector of momentum shall be in plane of the prefabricated wood slabs and perpendicular to the grain of the members. In contrast to EN 408, Clause 19, the forces shall be imposed approximately at a distance  $2 \times h$  from the supports to result in shear failure.

At least 10 tests shall be conducted. The test specimens shall be conditioned to constant mass and moisture content in an atmosphere having a relative humidity of  $65 \pm 5\%$  and a temperature of  $20 \pm 2^\circ\text{C}$ . In

addition, the moisture content and density of the specimens shall be determined according to EN 408, Clause 6 and Clause 7.

If shear failure of the prefabricated wood slabs is already covered by the bending tests, the value derived from these tests may be used.

Shear strength shall be evaluated according to:

$$f_v = 1.5 \cdot V / (w \cdot h)$$

with

V lateral force in N

w width of the specimen in mm

h height of the specimen in mm

Characteristic values shall be calculated according to EN 14358, Clause 3, logarithmically normally distributed.

### Expression of results

Shear strength  $f_{v,90,k}$  shall be stated in the ETA in MPa.

## 2.2.6 Dimensional stability

### Purpose of the assessment

Determination of dimensional stability of the prefabricated wood slabs by its shrinkage and swelling values.

### Assessment method

Shrinkage shall be tested according to ISO 13061-13.

Swelling shall be tested following ISO 13061-13 considering the following boundary conditions:

- Drying to constant mass at 20±2°C/30±5% relative humidity
- Conditioning to constant mass at 20±2°C/65±5% relative humidity
- Conditioning to constant mass at 20±2°C/85±5% relative humidity
- Storage under water for 7 days
- Conditioning to constant mass at 20±2°C/65±5% relative humidity
- Drying to constant mass at 103±2°C for the determination of the mass after drying.

In contrast to ISO 13061-13, the prefabricated wood slab specimen shall be composed of minimum 4 softwood timber members with a min. length of 200 mm. The critical configurations with maximum distance of dowel-type fasteners and minimum and maximum number of milled grooves shall be tested.

Total linear shrinkage value  $\beta$  shall be determined according to ISO 13061-13. Linear shrinkage value  $\beta_n$  shall be determined as:

$$\beta_n = \frac{l_{\beta 1} - l_{\beta}}{l_{\beta 1}} \cdot 100$$

with

$l_{\beta 1}$  dimensions at fibre saturation point in mm

$l_{\beta}$  dimensions at 20±2°C/65±5% relative humidity in mm

Linear and differential swelling values  $\alpha$  and  $q$  shall be determined in the three directions (height, thickness width) as:

$$\alpha = \frac{l_2 - l_1}{l_1} \cdot 100$$

$$q = \frac{l_2 - l_1}{l_1(u_2 - u_1)} \cdot 100$$

with



- $l_1$  dimensions at  $20\pm 2^\circ\text{C}/30\pm 5\%$  relative humidity in mm
- $l_2$  dimensions in mm after
- 1) conditioning to  $20\pm 2^\circ\text{C}/65\pm 5\%$  relative humidity
  - 2) conditioning to  $20\pm 2^\circ\text{C}/85\pm 5\%$  relative humidity
  - 3) conditioning to storage under water for 7 days
- $u_1$  moisture content at  $20\pm 2^\circ\text{C}/30\pm 5\%$  relative humidity in %
- $u_2$  moisture content in % after
- 1) conditioning to  $20\pm 2^\circ\text{C}/65\pm 5\%$  relative humidity
  - 2) conditioning to  $20\pm 2^\circ\text{C}/85\pm 5\%$  relative humidity
  - 3) conditioning to storage under water for 7 days

#### Expression of results

Total linear shrinkage value  $\beta$  and linear shrinkage value  $\beta_n$  shall be stated in the ETA in %.

Linear and differential swelling values  $\alpha$  and  $q$  shall be stated in the ETA in %.

### **2.2.7 Reaction to fire**

#### Purpose of the assessment and assessment method

The prefabricated wood slabs shall be tested, using the method(s) relevant for the corresponding reaction to fire class according to EN 13501-1. The prefabricated wood slabs shall be classified according to the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

For the mounting and fixing conditions of the specimens of the tests according to EN 13823 (SBI) the provisions in EN 16351, clause 4.4.3.2, shall apply. Tests according to EN ISO 11925-2 shall be conducted on free-hanging specimens without using an additional substrate.

Test results are valid for prefabricated wood slabs having

- the same type of wood or the same combination of wood types as tested,
- at least the density of the specimen tested, and
- at least the minimum overall thickness of the specimen tested.

#### Expression of results

The reaction to fire class shall be stated in the ETA together with the boundary conditions.

### **2.2.8 Resistance to fire**

#### Purpose of the assessment and assessment method

The part of the works or assembled system in which the prefabricated wood slabs are 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, Clause 7.3.2 for walls and Clause 7.3.3 for floors/roofs.

#### Expression of results

The resistance to fire class together with the boundary conditions shall be stated in the ETA.

### **2.2.9 Water vapour permeability – Water vapour transmission**

#### Purpose of the assessment and assessment method

Water vapour permeability shall be tested according to EN ISO 12572, condition A “dry cup” and condition C “wet cup” according to EN ISO 12572, Table 1.

### Expression of results

The water vapour resistance shall be stated in the ETA as wet cup factor  $\mu$  [-] and dry cup factor  $\mu$  [-].

#### **2.2.10 Airborne sound insulation**

##### Purpose of the assessment and assessment method

The airborne sound insulation of the assembled prefabricated wood slabs shall be tested on one specimen per build-up according to EN ISO 10140-2, considering the test arrangement according to Clause 6.2.

##### Expression of results

The weighted sound reduction index,  $R_w$  (C;  $C_{tr}$ ) according to EN ISO 717-1 shall be stated in the ETA together with the description of the build-up.

#### **2.2.11 Impact sound insulation**

##### Purpose of the assessment and assessment method

The impact sound insulation of the assembled prefabricated wood slabs shall be tested on one specimen per build-up according to EN ISO 10140-3 (reference method), considering the test arrangement according to Clause 6.2.

##### Expression of results

The weighted normalised impact sound pressure level,  $L_{n,w}$  (C<sub>i</sub>) according to EN ISO 717-2 shall be stated in the ETA together with the description of the build-up.

#### **2.2.12 Sound absorption**

##### Purpose of the assessment and assessment method

Sound absorption of the product to be used in walls, roofs or floors shall be tested according to Clause EN ISO 354 on one specimen mounting type A according to Annex B of EN ISO 354 per build-up.

##### Expression of results

The sound absorption coefficient  $\alpha_s$  according to EN ISO 11654, Clause 5.1, shall be stated in the ETA together with the description of the build-up.

#### **2.2.13 Thermal resistance**

##### Purpose of the assessment and assessment method

Thermal resistance shall be tested according to EN 12664, hot plate method, on a specimen with full/half<sup>3</sup> wall thickness. Faces shall be sealed airtight. Temperature difference for testing is 20 K.

The test specimen shall be conditioned to constant mass and moisture content in an atmosphere having a relative humidity of 65±5% and a temperature of 20±2°C. Equilibrium moisture content is reached when the results of two weightings within 6 hours differ by no more than 0,1% of the mass. Determination of moisture content according to EN 13183-2 and density according to EN 408, Clause 7.

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<sup>3</sup> For wall thickness > 200 mm.

### Expression of results

The thermal resistance value  $R$  in  $\text{m}^2\cdot\text{K}/\text{W}$  and thermal conductivity  $\lambda$  in  $\text{W}/(\text{m}\cdot\text{K})$  shall be stated in the ETA.

## **2.2.14 Air permeability**

### Purpose of the assessment and assessment method

Air permeability shall be tested according to EN 12114, Clause 7.2.2. The test pressure shall be chosen from the default values in EN 12114, Annex A.

Hereby, tests shall be performed on specimen composed of at least the smallest cross sections intended to be used.

The flow coefficient  $C$  [ $\text{m}^3/\text{s}\cdot\text{Pa}^n$ ] and flow exponent  $n$  [-] shall be assessed according to EN 12114, Clause 8.4 and Annex B. The equivalent leakage area  $A_L$  [ $\text{m}^2$ ] shall be assessed according to EN 12114, Clause 8.5.

### Expression of results

Air permeability shall be stated in the ETA as flow coefficient  $C$  [ $\text{m}^3/\text{s}\cdot\text{Pa}^n$ ], flow exponent  $n$  [-], and equivalent leakage area  $A_L$  [ $\text{m}^2$ ].

## **2.2.15 Thermal inertia**

### Purpose of the assessment and assessment method

The specific heat capacity (thermal inertia) of the product is represented by the performance of the components. The performance of thermal inertia of the components shall be expressed as an individual value of specific heat capacity  $c_p$  [ $\text{J}/\text{kg}\cdot\text{K}$ ] based on testing according to EN ISO 11357-4.

### Expression of results

Values for specific heat capacity  $c_p$  (thermal inertia) of components shall be stated in the ETA in  $\text{J}/\text{kg}\cdot\text{K}$ .

## **2.2.16 Natural durability of wood**

### Purpose of the assessment and assessment method

The natural durability of wood shall be tested for the respective timber species according to EN 350. For sampling EN 350, Clause 4.1.3 "Sampling sawn timber" applies. If the timber species is given in EN 350, Table B.1, testing is not necessary:

- For the following wood species the natural durability of wood can be given according to EN 350, Table B.1: for example Norway spruce (*Picea abies*, PCAB), Silver fir (*Abies alba*, ABAL), Scots pine (*Pinus sylvestris*, PNSY).

### Expression of results

The natural durability of wood shall be stated in the ETA together with the timber species.

### 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 Commission Decision 97/176/EC, as amended by Commission Decision 2001/596/EC.

The system is 2+.

#### 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 3.2.1.

**Table 3.2.1 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
<b>Factory production control (FPC)</b> [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Strength, stiffness and density properties of timber, species	Check of incoming materials	According to Control plan	According to Control plan	Each delivery
2	Strength, stiffness and density properties of dowel-type fasteners	Check of incoming materials	According to Control plan	According to Control plan	Each delivery
3	Finger joints in softwood timber members	According to Control plan	According to Control plan	3	per shift and strength class
4	Geometrical data	EN 336	According to Control plan	3	Once per shift and cross section
5	Moisture content of wood	According to Control plan	According to Control plan	According to Control plan	According to Control plan
6	Resistance to fire	Control of geometrical data and strength, stiffness and density properties	According to Control plan	According to Control plan	According to Control plan
7	Reaction to fire	Indirect testing: Check that the relevant parameters of the tests are fulfilled. Control of the minimum mean density, minimum overall thickness.	According to Control plan	According to Control plan	At least once per shift
8	Durability against biological attack	Check of species	According to Control plan	According to Control plan	Each delivery

### 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 prefabricated wood slabs are laid down in Table 3.3.1.

**Table 3.3.1 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
<b>Initial inspection of the manufacturing plant and of factory production control</b> <i>(for systems 1+, 1 and 2+ only)</i>					
1	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the prefabricated wood slabs.	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
<b>Continuous surveillance, assessment and evaluation of factory production control</b> <i>(for systems 1+, 1 and 2+ only)</i>					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	According to Control plan	According to Control plan	2/year

#### 4 REFERENCE DOCUMENTS

EAD 130320-00-0204:2018	Glued laminated timber made of solid hardwood
EN 350:2016	Durability of wood and wood-based products - Testing and classification of the durability to biological agents of wood and wood-based materials
EN 408:2010+A1:2012	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 1990:2002/A1:2005/AC:2010	Eurocode – Basis of structural design
EN 1995-1-1:2004+AC:2006+A1:2008+A2:2014	Eurocode 5 - Design of timber structures - Part 1-1: General – Common rules and rules for buildings
EN 12114:2000	Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method
EN ISO 12572:2016	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup 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 13183-2:2002+AC:2003	Moisture content of a piece of sawn timber - Part 2: Estimation by electrical resistance method
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13501-2:2016	Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13823:2020	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 14358:2016	Timber structures - Calculation of characteristic 5-percentile values and acceptance criteria for a sample
EN 16351:2021	Timber structures - Cross laminated timber - Requirements
ISO 13061-13:2016	Physical and mechanical properties of wood - Test methods for small clear wood specimens - Part 13: Determination of radial and tangential shrinkage
EN ISO 354:2003	Acoustics - Measurement of sound absorption in a reverberation room
EN ISO 717-1:2020	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation

EN ISO 717-2:2020	Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation
EN ISO 10140-2:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation
EN ISO 10140-3:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation
EN ISO 10456:2007+AC:2009	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values
EN ISO 11357-4:2021	Plastics - Differential scanning calorimetry (DSC) - Part 4: Determination of specific heat capacity
EN ISO 11654:1997	Acoustics - Sound absorbers for use in buildings - Rating of sound absorption
EN ISO 11925-2:2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test
EN ISO 22007-2:2022	Plastics - Determination of thermal conductivity and thermal diffusivity - Part 2: Transient plane heat source (hot disc) method