



EUROPEAN ASSESSMENT DOCUMENT

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POINT CONNECTOR – DOVETAIL MADE OF PLYWOOD FOR CROSS LAMINATED TIMBER

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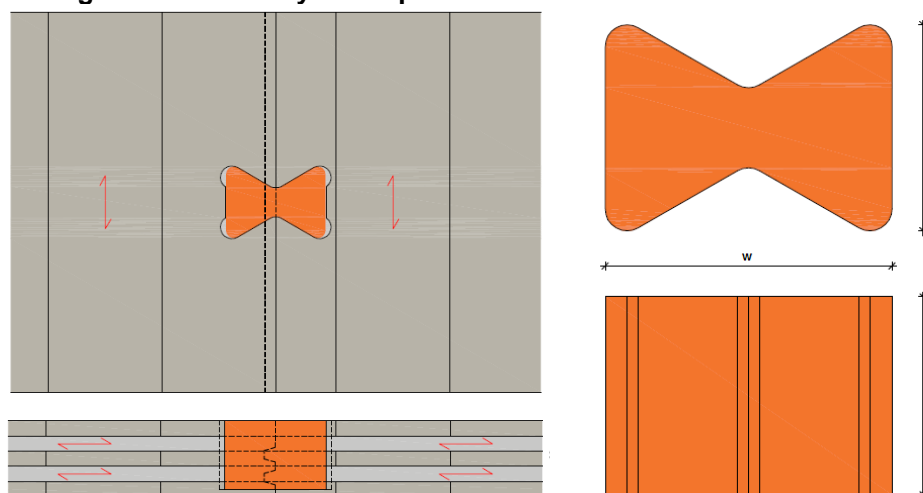
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1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD deals with the point connector for cross laminated timber. The point connector is made of plywood for load-bearing applications according to EN 636¹. The product is composed of a double-dovetail wedge, see Figure 1.

Figure 1: Geometry of the point connector for cross laminated timber



Timber species is European beech or birch.

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

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.

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 point connector is intended to be used as a shear connector for butt joints and able to cover tension loads. The point connector is not applicable to transfer bending moments.

The point connector is subjected to static and quasi static actions only.

The point connector is intended to be used in service classes 1 and 2 according to EN 1995-1-1.

¹ All undated references to standards or to EADs in this document are to be understood as references to the dated versions listed in clause 4.

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 point connector 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 works².

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 Spacing e_{conn} end and edge distance e_{end} and e_{edge}

Spacing, end and edge distance of the point connectors, see Figure 3.

1.3.2 Embedment depth d_e and remaining cross section t_{rest}

Milling depth of the point connector in the cross laminated timber and remaining cross section of cross laminated timber, see Figure 4.

² 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 1 shows how the performance of the point connector – dovetail made of plywood for cross laminated timber is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the point connector 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	Tension strength and stiffness	2.2.1	Description, level
2	Shear strength and stiffness	2.2.2	Description, level
3	Embedment depth	2.2.3	Description, level
4	Spacing, end and edge distances of the connector	2.2.4	Description, level
5	Dimensional stability	2.2.5	Description, level
Basic Works Requirement 2: Safety in case of fire			
6	Reaction to fire	2.2.6	Class
Basic Works Requirement 3: Hygiene, health and the environment			
7	Emission of formaldehyde	2.2.7	Description, class
Basic Works Requirement 4: Safety and accessibility in use			
–	Same as BWR 1		
Additional assessment			
8	Durability	2.2.8	Description
¹⁾ This characteristic also relates to BWR 4.			

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.

2.2.1 Tension strength and stiffness

Determination of tension strength and stiffness of the point connector shall be performed following the principles of EN 408, Clause 13.2. In contrast to EN 408 the time till rupture shall be in between 600 and 900 seconds. Load application according to EN 26891. The load-deformation plots shall be recorded.

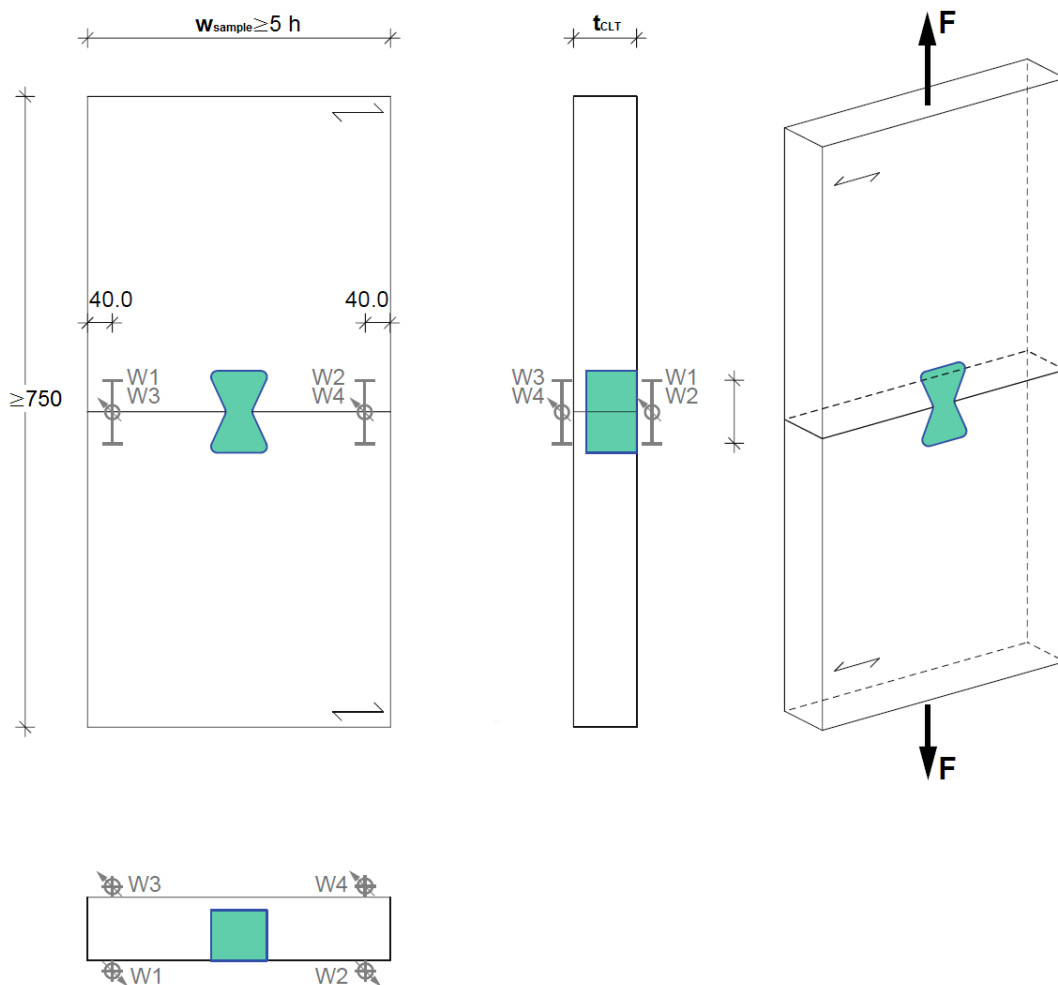
For the test configuration two elements are connected in a plane. The tension load is applied via steel brackets mounted with fully threaded screws. The width of the sample shall be at least 5 times the point connector height, the height of the sample is at least 750 mm.

The minimum number of tests is 20 samples per joint configuration and weakest wood species of the connector. A connection with one point connector shall be tested at least.

Figure 2 shows the test configuration to determine the tension strength and stiffness of the point connector for butt joints.

The position of the point connector in the elements shall be recorded.

Figure 2: Test configuration to determine the tension strength and stiffness of the point connector for butt joints



The 5 %-quantile values of tension strength shall be determined from the ultimate loads F_{max} per connector in accordance with EN 14358, Clause 3. The mean value of stiffness of one connector shall be determined according to EN 26891 and EN 14358, Clause 3.

The characteristic tension strength and mean value of stiffness shall be given in the ETA and is valid for the assessed size of the product.

2.2.2 Shear strength and stiffness

Determination of shear strength and stiffness of the point connector shall be performed by applying a load in the middle of the specimen described below. The loading equipment shall be able to measure the load applied on the specimen with an uncertainty of measurement of 1 %. The time till rupture shall be in between 600 and 900 seconds. Load application according to EN 26891. The load-deformation plots shall be recorded.

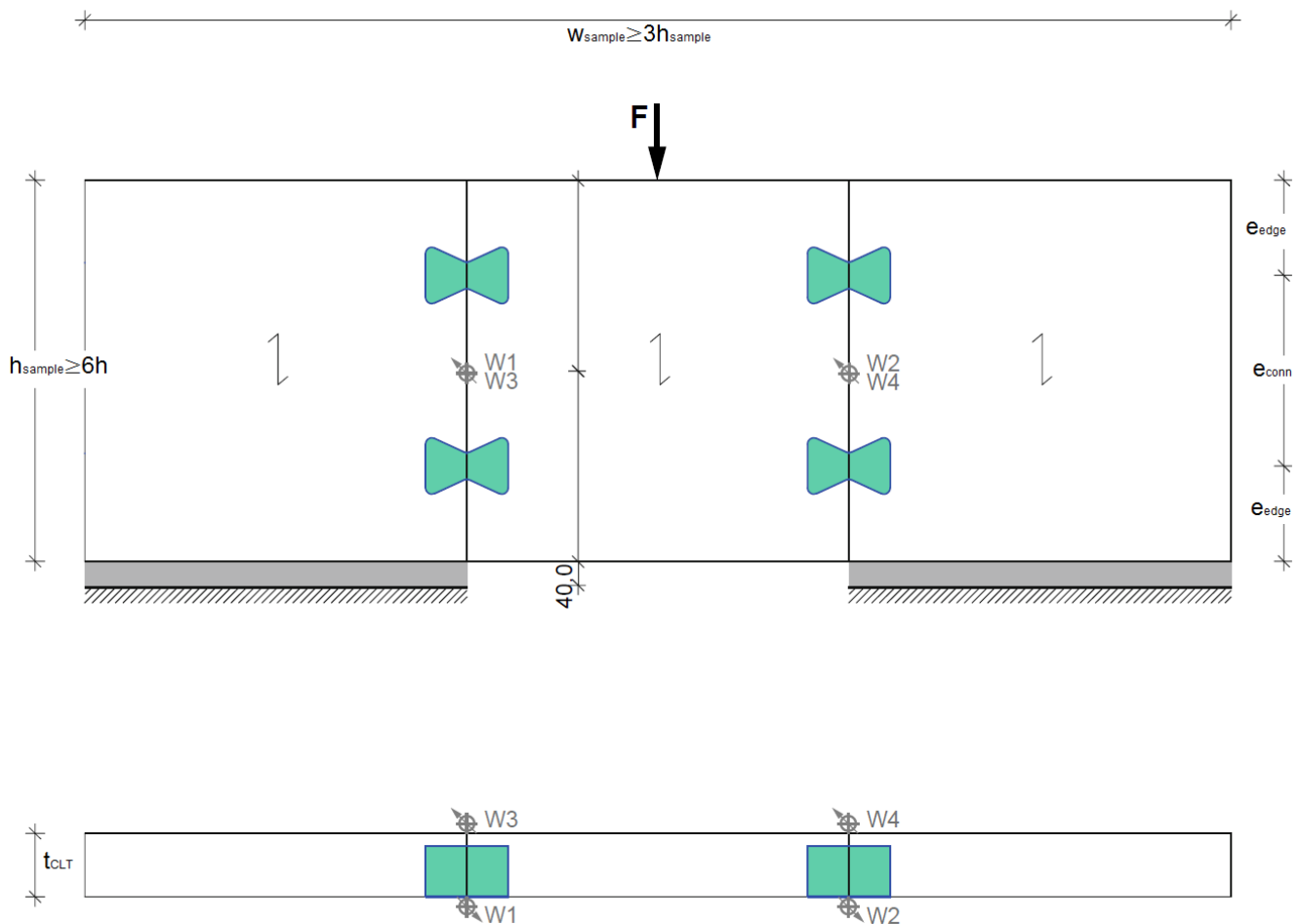
For the test configuration three elements are connected in a plane via two butt joints. The shear load is applied via a steel plate in the middle of the sample. The height of the sample shall be at least 6 times the point connector height, the width of the sample is 3 times the height of the sample.

The minimum number of tests is 20 samples per joint configuration and weakest wood species of the connector. A connection with two point connectors and maximum spacing shall be tested at least.

Figure 3 shows the test configuration to determine the shear strength and stiffness of the point connector for butt joints.

The position of the point connector in the elements shall be recorded.

Figure 3: Test configuration to determine the shear strength and stiffness of the point connector



The 5 %-quantile values of shear strength shall be determined from the ultimate loads F_{max} per connector in accordance with EN 14358, Clause 3. The mean value of stiffness of one connector shall be determined according to EN 26891 and EN 14358, Clause 3.

The characteristic shear strength and mean value of stiffness shall be given in the ETA and is valid for the assessed size of the product.

2.2.3 Embedment depth

The embedment depth of the connector d_e in the cross laminated timber and remaining cross section t_{rest} according to Figure 4 shall be assessed before testing according to Clause 2.2.1 and 2.2.2 by measuring the relevant dimensions of the point connector as well as the milling in the cross laminated timber using a calibrated device capable of achieving an accuracy of $\pm 1\%$ of the measurement. The minimum number of specimen is 5 per size of the point connector.

Figure 4: Embedment depth of the connector d_e in the cross laminated timber and remaining cross section t_{rest}



The embedment depth of the connector d_e and minimum remaining cross section $t_{rest,min}$ for the assessed size of the product shall be given in the ETA.

2.2.4 Spacing, end and edge distances of the connector

Spacing e_{conn} end and edge distances e_{end} and e_{edge} according to Figure 3 shall be assessed during testing according to Clause 2.2.1 and 2.2.2 by measuring using a calibrated device capable of achieving an accuracy of $\pm 1\%$ of the measurement. The minimum number of specimen is 5 per tested configuration.

The minimum spacing e_{conn} end and edge distances e_{end} and e_{edge} for the assessed product shall be given in the ETA.

2.2.5 Dimensional stability

The dimensions of the cross section of the point connector, width w , height h and length l according to Figure 1 shall be measured according to EN 1309-1. The minimum number of specimen is 5 per point connector dimension.

The dimensions and tolerances of the cross section shall be given in the ETA.

Stability of dimensions

The moisture content of the point connector shall be determined according to EN 322 and given in the ETA.

For the performance of the plywood, covered by hENs, the essential characteristics are declared already by the component manufacturers in their Declaration of Performance (DoP) when the product will be assessed by the TAB. The performance of those components for ETA purposes will be considered to be the performance declared by the manufacturers of the component.

2.2.6 Reaction to fire

Plywood with a minimum thickness of 9 mm and a minimum characteristic density of 600 kg/m^3 is considered to satisfy the requirements for performance class D-s2,d0 of the characteristic reaction to fire in accordance with the EC Decision 2003/43/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 2003/43/EC, it 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 Emission of formaldehyde

Testing according to EN 13986, Clause 5.7.

For the performance of the plywood material, covered by hENs, the essential characteristics are declared already by the component manufacturers in their Declaration of Performance (DoP) when the product will be assessed by the TAB. The performance of those components for ETA purposes will be considered to be the performance declared by the manufacturers of the component.

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

2.2.8 Durability

Testing according to EN 13986, Clause 5.6.

For the performance of the plywood material, covered by hENs, the essential characteristics are declared already by the component manufacturers in their Declaration of Performance (DoP) when the product will be assessed by the TAB. The performance of those components for ETA purposes will be considered to be the performance declared by the manufacturers of the component.

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

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: 3

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 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) [including testing of samples taken at the factory in accordance with a prescribed test plan]*					
1	Bending strength and stiffness as well as density of plywood	EN 310 and EN 323	Laid down in the control plan	1	DoP, where relevant, or 1 in 1000 manufactured panels and maximum 1 panel per shift
2	Visual inspection of joints	Visual	Laid down in the control plan	3	Every joint
3	Dimensions and moisture content of joint	Laid down in the control plan	Laid down in the control plan	1	Every 5 point connectors, at least 3 per joint
4	Dimensions	Measurement gauge	Laid down in the control plan	1	Per day and per changeover of working shift

4 REFERENCE DOCUMENTS

EN 310:1993	Wood-based panels – Determination of modulus of elasticity in bending and of bending strength
EN 322:1993	Wood-based panels – Determination of moisture content
EN 323:1993	Wood-based panels – Determination of density
EN 408:2012	Timber structures – Structural timber and glued laminated timber – Determination of some physical and mechanical properties
EN 636:2012+A1:2015	Plywood – Specifications
EN 1309-1:1997	Round and sawn timber – Method of measurement of dimensions – Part 1: Sawn timber
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 13501-1:2007 +A1:2009	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN 13986:2004 +A1:2015	Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking
EN 14358:2016	Timber structures – Calculation of characteristic 5-percentile values and acceptance criteria for a sample
EN 26891:1991	Timber structures – Joints made with mechanical fasteners – General principles for the determination of strength and deformation characteristics