If the manufacturer carries out parts of the production himself, the operations under b) may be reduced and partly replaced by operations under a). Generally, the more parts of the production that are carried out by the manufacturer, the more operations under b) may be replaced by operations under a).

In any case the operation shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

NOTE Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b).

The operations under a) refer to the intermediate states of the product as on manufacturing machines and their adjustment, and measuring equipment etc. These controls and tests and their frequency shall be chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters, etc.

The manufacturer shall establish and maintain records that provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria and shall be available for at least three years.

These records shall be available for inspection.

Where the product fails to satisfy the acceptance measures, the provisions for non-complying products shall apply, the necessary corrective action shall immediately be taken and the products or batches not complying shall be isolated and properly identified.

Once the fault has been corrected, the test or verification in question shall be repeated.

The results of controls and tests shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the name of the person responsible for the control/test.

With regard to any control result not meeting the requirements of this European Standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, destruction or correction of product) shall be indicated in the records.

Individual products or batches of products and the related manufacturing documentation shall be completely identifiable and traceable.

6.4 Initial inspection of factory and of FPC

Initial inspection of factory and of FPC shall be carried out when the production process has been finalised and is in operation. The factory and FPC documentation shall be assessed to verify that the requirements of 6.3.2 and 6.3.3 are fulfilled.

During the inspection it shall be verified:

- a) that all resources necessary for the achievement of the product characteristics required by this European Standard are in place and correctly implemented, and
- b) that the FPC-procedures in accordance with the FPC documentation are followed in practice, and
- c) that the product complies with the Initial Type Testing samples, for which compliance with this European Standard has been verified.

All locations where final assembly or at least final testing of the relevant product is performed shall be assessed to verify that the above conditions a) to c) are in place and implemented. If the FPC system covers more than one product, production line or production process, and it is verified that the general requirements are fulfilled when assessing one product, production line or production process, then the assessment of the general requirements does not need to be repeated when assessing the FPC for another product, production line or production process.

All assessments and their results shall be documented in the initial inspection report.

6.5 Continuous surveillance of FPC

Surveillance of the FPC shall be undertaken twice per year and shall usually be unannounced. The surveillance of the FPC shall include a review of the FPC test plan(s) and production processes(s) for each product to determine if any changes have been made since the last assessment or surveillance. The significance of any changes shall be assessed.

Checks shall be made to ensure that the test plans are still correctly implemented and that the production equipment is still correctly maintained and calibrated or verified.

The records of tests and measurement made during the production process and to finished products shall be reviewed to ensure that the values obtained still correspond with those values for the samples submitted to Initial Type Testing and that the correct actions have been taken for non-compliant devices.

6.6 Procedure for modifications

If modifications are made to the product, production process or FPC system that could affect any of the product characteristics required by this standard, then all the characteristics for which the manufacturer declares performance, which may be affected by the modification, shall be subject to Initial Type Testing, except as described in 6.2.1 and 6.3.2.7.

Where relevant, a re-assessment of the factory and of the FPC system shall be performed for those aspects, which may be affected by the modification.

All assessments and their results shall be documented in a report.

7 Marking and labelling

7.1 General

Each glued laminated product, which complies with this European Standard, shall be durably marked on its surface or on a durable label affixed on it, with the information as given below.

When regulatory marking provisions require information on some of the items listed in 7.2 and 7.3 the requirements of these subsections concerning these items are deemed to be met.

Where the glued laminated product is cut into parts each part has to be re-marked.

In exceptional cases, the end use may require marking to be omitted for aesthetic reasons. In such cases, when the customer specifically requests or orders the glued laminated products to be free from marks, each delivery shall be dispatched under the cover of a document stating the following minimum information.

- customer's name and address;
- customer's purchase order number;
- dimensions and quantities of the delivered glued laminated timber or glued solid timber.

7.2 Glued laminated products

The following information shall be given for glued laminated timber, glued solid timber and block glued glulam:

- a) identity of the manufacturer, logo or name;
- b) strength, stiffness and density values of the glued laminated timber or the glued solid timber;

NOTE 1 This is usually done by reference to a strength class according to Table 3 or 4 or to a manufacturer specific strength class.

NOTE 2 For the designation of manufacturer specific strength classes, glulam with asymmetrical layup, resawn and brick-bonded glulam see also 5.1.3.

NOTE 3 Coded marking, e.g. continuous scratching of all laminations, is allowed.

- c) "Brick-bonded", if member has a cross sectional layup according to I.5.2;
- d) the topside of a glued laminated product having an asymmetrical cross-sectional layup shall be clearly marked with "Top" unless there is no danger to mistake which side is the topside (e.g. for curved members);
- e) production week and year or traceability code;
- f) adhesive type according to prEN 301 or EN 15425 and adhesive family according to 5.5.3.1;
- g) bonding strength test method declared as "A", "B", "C", if tested by delamination method A, B or C or by "S" if tested by block shear test;
- h) "PT", if the glued laminated timber or glued solid timber is treated against biological attack.

7.3 Additional for glulam with large finger joints

a) Characteristic bending strength of the large finger joint.

Annex A

(normative)

Release of Formaldehyde

A.1 General

Glued laminated products may release formaldehyde.

A.2 Classification

A.2.1 Glued laminated timber or glued solid timber

A.2.1.1 Requirements

Where formaldehyde-containing adhesives are used, the subsequent release of formaldehyde from glued laminated timber or glued solid timber shall be assessed by testing as specified in A.2.1.2 and the corresponding class according to Table A.1 declared or classified as E2 without testing. The evaluation of release of formaldehyde shall be carried out for each type of adhesive used.

The maximum steady state emission values for glued laminated timber or for glued solid timber shall be used, when assessing the formaldehyde release as Classes E1 or E2 according to Table A.1.

Formaldehyde release classes	Maximum steady state emission values (in mg HCHO/m ³ air)	
E1	≤ 0,124	
E2	> 0,124	

Table A.1 — Release of formaldehyde classes

Glued laminated products, produced with an adhesive not containing formaldehyde, may be assigned to class E1 without testing.

NOTE 1 In conventional structures under typical conditions of use, glued laminated products, conforming to formaldehyde release class E1 is unlikely to result in an indoor air concentration exceeding 0,1 ppm formaldehyde.

NOTE 2 In certain Member States only glued laminated products of class E1 are allowed.

A.2.1.2 Test procedure

The testing in a chamber shall be carried out according to EN 717-1 with a loading factor of $0,3 \text{ m}^2/\text{m}^3$. A test chamber with a volume of at least 1m^3 shall be used.

The ends of the specimens shall be sealed.

A.2.1.3 Test report

A test report according to EN 717-1 shall be given.

A.2.2 Classification for glulam with large finger joints and block glued glulam

Glulam with large finger joints and block glued glulam shall be assigned to the formaldehyde emission class of the glulam components from which they are made. Only the highest formaldehyde emission class of the components shall be declared.

Annex B

(normative)

Additional test methods and requirements for adhesives

B.1 General

The adhesives to be tested shall be ready for use and shall be, if the manufacturer of the glued products intends to mix them before application in the subsequent production, mixed according to the instructions of the adhesive manufacturer. They shall have the viscosity in which they are used in practice. If no other specifications are given by the adhesive manufacturer the hardener shall be stirred in for 5 min using a stirring device.

B.2 Long-term sustained load test at cyclic climate conditions with specimens loaded perpendicular to the glue line for moisture curing one-component polyurethane and emulsion polymer isocyanate adhesives

B.2.1 General description

The tests shall be performed with specimens according to prEN 302-3. As a divergence to prEN 302-3, the specimens are made from beech wood with glue line thickness of 0,1 mm and 0,5 mm. The beech wood boards from which the specimens are cut shall be free from knots, straight grained and shall have a density larger than 650 kg/m³ at 20 °C/65 % rh. The timber prior to specimen manufacture shall be conditioned in a climate chamber at storage conditions of (20 ± 2) °C and (65 ± 5) % rh. The moisture content shall be (12 ± 1) %.

B.2.2 Production of the specimens

In total, 5 sticks with a cross section of 50 mm \times 60 mm and a length of at least 700 mm, enabling the cutting of 8 test specimens and 2 reserve specimens from each stick of the specimen type described in prEN 302-3, shall be manufactured for each glue line thickness. The ten specimens for each test are made up of two specimens (see Figure B.2) from each stick. Figure B.2 gives a view of the stick and of the cutting scheme for its subdivision into 10 specimens for the determination of the tensile strength perpendicular to the glue line. The manufacture and build-up of the sticks shall follow the scheme shown in Figure B.1a) and B.1b). The annual ring orientation of both components glued together shall be roughly co-linear and shall be in the range of 30° to 60°.

NOTE For details of cutting see prEN 302-3:2011, Clause 5, and Figure B.1.

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Dimensions in mm



Key

1 and 2 positions of corners before cutting and after planing

a) Dimensions before cutting

b) Dimensions after planing

Figure B.1 — Cutting scheme of the parts of the test sticks

Dimensions in mm



Key

- 1 test batch (BC= control batch, BD x = batch for a test after a duration of x months)
- 2 current specimen number
- 3 reserve sample

Figure B.2 — Cutting scheme for test stick and numbering of specimens

B.2.3 Test procedure and climate conditions

The test procedure shall consist of the following test series:

- a) short-term testing of a control batch BC of 10 specimens in ramp loading. The specimens are tested after fourteen days of conditioning in (20 ± 2) °C and (65 ± 5) % rh subsequent to gluing;
- b) long-term testing of 3 batches BD3, BD6, BD12, each with 10 specimens, whereby each batch shall be subjected to a different duration of loading time being 3, 6 and 12 months. All batches shall be subjected

to the same constant stress level specified below. At the end of each loading period, all specimens of the respective batch not having failed shall be tested for residual tensile strength perpendicular to the glue line in ramp loading.

Constant stress equal in all 3 duration of load times shall be 1 N/mm² related to the net cross section of $25 \text{ mm} \times 50 \text{ mm}$.

The test climate shall be at natural outdoor conditions in Europe between latitude 45 and 60 degrees protected with light penetrable covering (glass house).

An alternative test procedure is to use a climate chamber with cyclically stepped climate varying stepwise with 24 h step length between two climates $(10 \pm 2)^{\circ}$ C with (90 ± 5) %rh and $(35 \pm 2)^{\circ}$ C with (40 ± 5) % rh.

The specimens tested for residual strength after removal of the constant long-term load shall be conditioned at least for 2 weeks in climate $(20 \pm 2)^{\circ}$ C and (65 ± 5) %rh before ramp loading.

The climate shall be recorded.

B.2.4 Requirements

The mean tensile strength perpendicular to the grain of the control batch BC and of each of the batches BD3, BD6 and BD12 tested for residual strength after 3, 6 and 12 months of duration of load shall not be less than 5 N/mm². In each batch tested in long-term loading only one specimen may fail within each of the respective load duration periods. In case a specimen has failed in long-term loading, the mean value of the residual strength of the respective batch shall be calculated from the remaining 9 specimens.

B.2.5 Report

A test report according to prEN 302-3 and records of the climate during testing shall be given.

B.3 Delamination test for finger joints in laminations

B.3.1 Production of the specimens

The finger joints shall be produced in accordance with I.4.

The finger length shall be less than 25 mm.

For the production of the finger joints spruce (*Picea abies L*.) shall be used. The boards shall have a thickness of at least 45 mm and a width of at least 185 mm before jointing and planing. Within a bothway distance of at least 100 mm from the finger base, measured in the direction of the axis of the board, the boards shall be clear of knots having a diameter larger than 6 mm and other features that might negatively affect the strength of a finger joint such as reaction wood. The boards shall have a mean density of $(425 \pm 25) \text{ kg/m}^3$.

A sufficient number of finger joints shall be produced so that 10 specimens can be sampled for each proportion of resin and hardener to be tested.

After a curing time of at least seven days the jointed boards shall be planed to a thickness of at least 40 mm and to a width of at least 170 mm. Specimens with a length of 100 mm (measured in the direction of the axis of the board) shall be cut. The specimens shall be cut in a way that part of the finger joint, having a length of $(l_j/2 \pm 1 \text{ mm})$, where l_j is the length of the finger joint (in mm), is part of the specimens and that the joint becomes visible at the end grain of the cross cut (see Figure B.3).

Dimensions in mm



Key

1, 2, 3 number of finger tip

a) Dimensions

b) Numbering of finger tips

Figure B.3 — Specimens for delamination tests with finger joints in laminations

B.3.2 Testing

Before testing the specimens are weighed and the moisture content u measured using a moisture meter in accordance with EN 13183-2 or EN 13183-3.

The corrected weight at a moisture content u = 19 % shall be calculated.

The total length $l_{\text{tot, glue line}}$ of the glue lines visible on both wide faces of the cross cut finger joint shall be measured.

The specimens shall be subject to the following cyclic conditions: The specimens are completely immersed in boiling water for 6 h and in cold water (20 ± 5) °C for 1 h subsequently. After this the specimens are dried in a drying duct at a temperature of (60 ± 3) °C to a moisture content of u < 19 %, but at least for 18 h.

B.3.3 Results

Within one hour after the end of the last drying cycle the total length of the delaminations $l_{\text{tot, delam}}$ shall be marked and measured at the cross cut of the specimens.

Isolated openings of glue lines having a length of less than 3 mm may be disregarded.

The total delamination of a test piece shall be calculated from the ratio of the total length of the delaminations and the total length of the glue lines.

B.3.4 Report

The following items shall be reported:

- a) reference to this European Standard;
- b) date of the test;
- c) identification of test pieces; any other relevant information, e.g. about preconditioning;
- d) type of adhesive, e.g. resin and hardener;

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- e) effective proportion of resin and hardener (if relevant);
- f) moisture content;
- g) corrected weight at a moisture content of 19 %;
- h) the total delamination according to B.3.3;
- i) any relevant observation linked to the testing;
- j) name of the person responsible for the testing.

Annex C

(normative)

Delamination test of glue lines

C.1 Principle

A gradient is introduced in the moisture content of the wood to build up internal stresses. This will result in tensile stresses perpendicular to the glue lines between laminations of glulam, glued solid timber and block glued glulam. Inadequate glue line integrity will result in delamination of the glue lines.

C.2 Apparatus

C.2.1 Pressure vessel

A pressure vessel shall be used, which safely withstands a pressure of at least 600 kPa (700 kPa absolute pressure) and a vacuum of at least 85 kPa (15 kPa absolute pressure) and is equipped with pumps or similar device capable of giving a pressure of at least 600 kPa (700 kPa absolute pressure) and of drawing a vacuum of at least 85 kPa (15 kPa absolute pressure).

NOTE 100 kPa is equal to 1 bar.

C.2.2 Drying duct

A drying duct shall be used where air is circulated at a velocity from 2 m/s up to 3 m/s (inclusive), and at a temperature and a relative humidity as given in Table C.1.

	Method A	Method B	Method C
Temperature (°C)	60 to 70	65 to 75	25 to 30
Relative humidity, rh (%)	< 15	8 to 10	25 to 35

Table C.1 — Climate in the drying duct for the different methods

C.2.3 Balance

Balance shall be capable for determining mass with a tolerance of \pm 5 g.

C.2.4 Metal wedge and hammer

Metal wedge and hammer shall be capable of splitting glue lines open.

C.3 Sampling and preparation of test pieces

The test pieces shall be prepared or selected in such a manner that they are representative of the production run.

Each test piece shall be taken from a full cross section of the specimens to be tested, prepared by cutting perpendicular to the grain of the wood. It shall be (75 ± 5) mm in length (along the grain).