

EUROPEAN ASSESSMENT DOCUMENT

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**MONOLITHIC OR LAMINATED
BEAM AND WALL LOGS
MADE OF TIMBER**

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1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD deals with monolithic or laminated beam and wall logs to be used in buildings, made of pine and spruce grown on the Nordic timber source or any comparable European timber source (later on called logs). Monolithic beam and wall logs made of timber are made without any other additional materials, except of an optional surface treatment, in the finished product. Laminated beam and wall logs made of timber are made without any other additional materials than adhesive, except of a possible surface treatment, in the finished product. Logs are manufactured from round stocks, sawn timber or glued blanks. The overall shape of the logs may be rectangular or round. They may be vertically or horizontally laminated so, that the glue lines are staggered or not. Products may also be cross laminated.

Logs are shaped so that they form prefabricated building elements that can be assembled to a building without any or with a lesser amount of additional cutting or tooling. The shape of the logs is achieved by automatic machinery or handicraft methods. This EAD also refers to log blanks that are not yet shaped.

Logs are usually intended to be part of a certain log building kit. Additional components needed for the kit as dowels, sealing strips etc. are outside of the scope of this EAD. However, when the manufacturer wants to declare performances as apparent compression strength perpendicular to grain or impact resistance, he shall declare which kind of components shall be added to the kit the declared values to be achieved.

This EAD includes logs, the surface of which is chemically treated against insects or stain, if these treatments do not have an influence to the other performance of the logs or to the corrosion of the fasteners. However, the effectiveness of the treatment is outside the scope of this EAD.

The manufacturer may define different product types according to following criteria:

- Species: pine, spruce, other and growth area (see 1.1)
- Intended use; beam logs or wall logs (see 1.2, 1.3.7 and 1.3.8)
- Log shape and lay-up of laminated products: rectangular, round, special shape, blank (see 1.3)
- Use of lamination technics: monolithic, laminated (see 1.3)
- Use of finger jointing: finger jointed laminations, finger jointed logs, no finger joints
- Glue bond quality: as defined in 2.2.4
- Type of adhesive: phenolic and aminoplastic adhesives, polyurethane adhesives
- Strength class, grading method used and mechanical properties (see 2.2.1)
- Durability against fungi and insects (see 1.2.3 and 1.2.4)
- Chemical treatment: treated or not treated (see 2.2.9)
- Delivery moisture content (see 2.2.5)

The manufacture may produce logs with several combinations of properties to be defined in the ETA.

The effects of any other kinds of treatments (fire protective or decay protective or aesthetic; chemical or physical) on the performance of the logs or to the corrosion of the fasteners shall be separately clarified. These kinds of treated logs are outside the scope of this EAD.

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)

Logs made of timber are intended to be used as structural or non-structural components in buildings in service classes 1-3 as defined in EN 1995-1-1.

1.2.2 Working life

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 logs for the intended use of 50 years when installed in the works provided that the logs are 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 works¹.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.2.3 Natural durability against fungi

Natural durability of the logs against fungi is evaluated based on data given in EN 350-2. Natural durability shall be sufficient for the intended service class as defined in EN 1995-1-1.

Logs made of spruce or pine have natural durability against fungi according to class 5 (not durable). If logs made of pine only contain heartwood, their natural durability against fungi is according to class 3-4 (durable or slightly durable).

Surface treatments against stain are not effective against decay caused by fungi.

Note 1 The service life of logs depends on the other materials used for the construction (sealing strips, surface treatments) and the design of the construction.

Note 2 Provision for the use of the logs in service class 3 is that the logs are able to dry periodically. Correctly designed and built, a log construction of this kind has the estimated lifetime of at least 50 years. In use conditions, the moisture content of logs shall not exceed 30 % for a long time or frequently. In some Member states regulations respective wood preservation have to be considered.

In the ETA shall a statement regarding this be made: "In use conditions, the moisture content of logs shall not exceed 30 % for a long time or frequently. In some Member states regulations respective wood preservation have to be considered."

Note 3 When laminated logs are made, the heartwood is often turned to the surface of the log. However, the durability of these logs against fungi is still of class 5 if they also contain sapwood. In unfavourable conditions the decay of logs may start in the internal parts of the log and may proceed extensively before it will become evident on the surface of the log or cause visible damage for the construction.

1.2.4 Durability against insects

Natural durability of the logs against insects is evaluated based on data given in EN 350-2. Logs made of pine or spruce are not durable against insects.

¹ The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

The effect of any surface treatment against insects shall be separately clarified and is outside of this EAD.

Note: If the intended use has a risk for damage caused by insects, the logs shall be protected by the purchaser, either by constructional means or chemically, according to the requirements valid on the place of use. The possible effects of any treatment chemical to all properties of the logs shall be separately clarified.

1.3 Specific terms used in this EAD

1.3.1 Log

A shaped piece of wood, the thickness of which is at least 68 mm.

Note Logs with monolithic cross section are manufactured from sawn timber that has a minimum thickness of 75 mm. They may be finger jointed.

1.3.2 Rectangular log

A log the overall shape of which is rectangular. The cross section deviates from rectangular having tongue and groove profile, blockings and other shaping as holes and grooves for walls etc.



1.3.3 Round log

A log the overall shape of which is round. The cross section deviates from round having tongue and groove profile, blockings and other shaping as holes and grooves for walls etc.



1.3.4 Log with special shape

A log that is neither rectangular nor round, as D-shaped, or the cross section varies along the log. The manufacturer shall describe separately the shape of this kind of log.

1.3.5 Monolithic log

A log the cross section of which is made of one piece of wood.

Note: Monolithic logs may have (finger) joints that cover the whole cross section.

1.3.6 Laminated log

A log made of a laminated log blank. Laminated logs may be vertically or horizontally laminated, multiple laminated or cross laminated according to the laminated log blank they are made from

1.3.7 Beam log

A log that fulfils all the requirements set for load bearing timber construction (ER1) and thus is suitable to be used as beam constructions, where the possible glue lines get shear stress.

1.3.8 Wall log

A log that fulfils all the requirements set for timber construction with regard to safety in use (ER4) and thus is suitable to be used in walls.

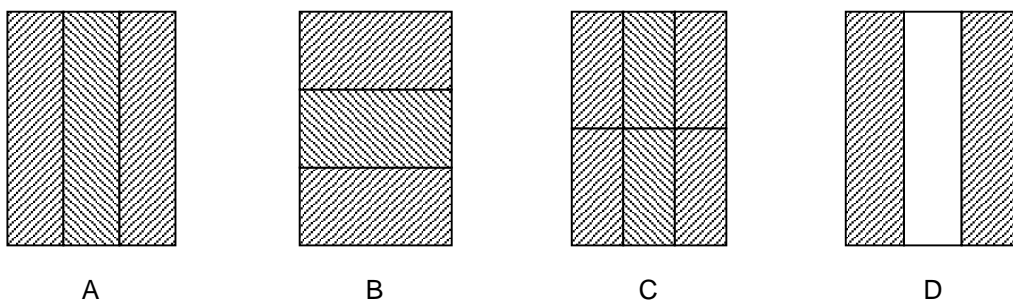
Note: If there are joints and glue lines in wall logs they shall not be loaded by shear stress.

1.3.9 Log blank

A pre-stage of a log that does not yet have the final shape as blockings.

1.3.10 Laminated log blank

A log blank made by gluing from smaller cross sections, which may be finger jointed in their longitudinal direction. Laminated log blanks may be vertically (A) or horizontally (B) laminated, multiple laminated (C) or cross laminated (D) (see drawing below).



1.3.11 (Log) lamination

A part of a laminated log blank.

1.3.12 Tier of logs

A layer made of logs.

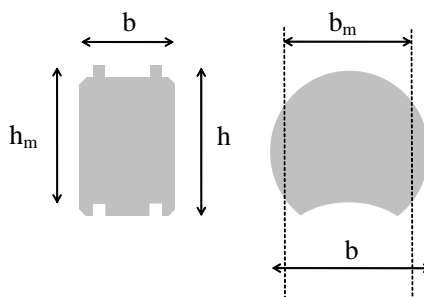
Note: The tiers of logs are numbered from below upwards (in the order of assembly) and the logs at gables

1.3.13 Seam

Horizontal connection of the logs. In the final construction, there may or may not be a sealing strip in the seam.

1.3.14 Thickness, nominal thickness

The dimension of a log perpendicular to the wall plane made by the logs. Thickness may vary. Nominal thickness is the thickness in the middle of the log; b (see drawing below)



1.3.15 Mean thickness

The area of the log cross section divided by the rise; b_m .

1.3.16 Effective thickness

Thickness value to be used in strength calculations; b_{eff} . For rectangular logs this is usually taken as 0,75 x of the thickness of the log, and for round logs as 0,5 x of the nominal thickness of the log.

1.3.17 Depth

The largest measurement between the upper and bottom surface of the log; h .

1.3.18 Rise

The measurement between the upper sides of the upper and lower log; h_m .

1.3.19 Effective depth

Depth value to be used in strength calculations; h_{eff} . For rectangular logs this is usually taken as rise of the log, h_m . For other types of logs this shall be defined in the ETA.

1.3.20 Length

Total length of the log.

1.3.21 Apparent characteristic compression strength perpendicular to grain

Apparent characteristic compression strength perpendicular to grain is the value to be used in calculations, where the effect of the wall instability (buckling) is taken into account.

1.3.22 Moisture content

The amount of water contained by the logs as percentage from the oven dry mass.

1.3.23 Delivery moisture content

Moisture content at the depth about 20 mm from the surface of the log.

Note Delivery moisture content is normally declared as moisture content at manufacturing - the finished logs are stored after manufacturing so that the moisture content is within the tolerances announced by the manufacturer

1.3.24 Growth region

Growth region in the sense of EN 14081-1 or such a combination of growth regions where it has been stated that the applied grading rules are valid.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of logs is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and assessment methods and criteria for 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	Mechanical properties*	2.2.1	level or class
2	Apparent compression strength perpendicular to grain*	2.2.2	level
3	Properties of finger joints*	2.2.3	level, description
4	Glue bond quality of laminated logs*	2.2.4	level, description
5	Delivery moisture content*	2.2.12	level
6	Dimensional tolerances*	2.2.15	level
Basic Works Requirement 2: Safety in case of fire			
7	Reaction to fire	2.2.5	class
8	Resistance to fire	2.2.6	level or class
Basic Works Requirement 3: Hygiene, health and the environment			
9	Content and/or release of dangerous substances	2.2.7	level, class, description
10	Water vapour permeability	2.2.8	level
Basic Works Requirement 4: Safety and accessibility in use			
11	Impact resistance	2.2.9	level, class, description
Basic Works Requirement 6: Energy economy and heat retention			
12	Thermal conductivity and thermal transmittance	2.2.10	level
13	Thermal inertia	2.2.11	level
Basic Works Requirement 7: Sustainable use of natural resources NPD			
*) These characteristics also relate to BWR 4.			

Instead of using the methods and criteria given in Table 1 under numbers 1, 2, 7 and 8, the performance with regard to the characteristics concerned may also be established by long term experience on site, provided that

- this long term experience is well documented, and
- the product subject to the assessment procedure is the same as the product for which the performance is established by this long term experience.

To facilitate the expression of different performances of the product with regard to combinations of product characteristics referred to in Table 1, distinction is made between the following use categories:

- Beam logs, see 1.3.7 ER1 is relevant and NPD is not an option; ER4 is not relevant.
- Wall logs, see 1.3.8, ER4 is relevant and NPD is not an option; ER1 is not necessary relevant.

2.2 Assessment methods and criteria for 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 those given in clause 2.3.

2.2.1 Mechanical properties

For structural calculations, mechanical properties corresponding to those given for strength classes in EN 338 shall be determined. The characteristic strength values and mean and characteristic modules of elasticity shall be given in accordance with EN 1995-1-1. The reference moisture content shall be consistent with 20 °C and 65 % relative humidity as defined in EN 384.

Strength modification factors for service classes and load-duration classes as well as deformation modification factors for service classes given for solid timber in EN 1995-1-1 are recommended to be used and be re-given in the ETA.

Log is a structural component in the sense of GPL. In this case the most common way to give the performance is according to method 1, which is to give the shape of the component together with the mechanical properties.

Mechanical properties of logs and log laminations are determined according to the grading system of timber. Rectangular logs and log laminations are graded as sawn timber according to the methods given in EN 14081-1. If the strength of the log laminations is not equal, the strength of laminated log can be calculated.

For round logs, visually grading rules can be established based on grading standards or tests as part of the ETA issuing process. Grading rules shall fulfil the requirements in EN 14081-1. Grading rules for pine and spruce can be based e.g. on BS 4978 that is referred to in EN 1912.

The strength class of whole logs can alternatively be determined experimentally applying EN 384, EOTA TR 002 and EN 408. For cross laminated logs, mechanical properties shall always be verified experimentally. The sample to be tested is at least 20 logs. The sample shall be representative for the species and growth area and preselecting conditions used in manufacturing of the logs (e.g. top log - intermediate log - bottom log).

Cross section dimensions used in calculations can be simplified so that instead of the exact cross section, an approximation (effective thickness and effective depth) can be used. This simplified cross section shall be used in a similar manner in the design calculations.

Characteristic value can be determined according to the ranking method given in EN 384. If the sample size is below 40 the reference strength is calculated by one decimal so, that the strength of the poorest specimen is multiplied by a factor $k_G = 0,7$. In case of whole laminated logs and cross laminated logs characteristic values can be calculated according to EN 14358.

(Deviation from EN 384. Sample size is reduced. This corresponds better to the one normally required for finger joints, 15 pieces. Also, the cross section to be tested normally is composed of several pieces, so there will be a multiple of 20 pieces represented in the test. Factor 0,7 corresponds to standard deviation of about 0,20.)

Logs can be assigned to a strength class according to EN 338 or have an individual strength profile. Only those properties needed for the intended use may be determined.

When effective thickness and effective depth have been used, the definition and use of these shall be clarified in the ETA.

2.2.2 Apparent characteristic compression strength perpendicular to grain

Apparent characteristic compression strength perpendicular to grain shall be determined by tests made with full size walls. The test shall follow the principles given in EOTA TR 002 with regard to load cycles. The buckling of the wall shall not be prevented by other means than typical for the construction in intended kit use, e.g. dowels, sealing strips and cross corners.

At least three walls shall be tested, but they may have different log profiles. In that case, principles of design assisted by testing shall be applied.

The load corresponding to the buckling of the wall shall be recorded. Apparent characteristic compression strength $f_{c,90,a,k}$ perpendicular to grain shall be calculated from the characteristic buckling load F_k and the effective thickness of the log wall b_{eff} or mean thickness to be used in strength calculations and the length of the test wall L according to equation

$$f_{c,90,a,k} = \frac{F_k}{b_{eff} L}$$

F_k can be estimated to be the smallest value achieved multiplied by factor 0,7, or calculated according to EN 14358.

For wall logs, apparent characteristic compression strength perpendicular to grain can be established by long term experience on site.

Apparent characteristic compression strength shall be given in the ETA together with the effective thickness used.

2.2.3 Properties of finger joints

Verification methods for adhesives for finger joints are given in EN 14080 with reference standards (phenolic and aminoplastic adhesives or polyurethane adhesives) or ETAs for adhesives for load bearing timber structures.

Verification methods for the strength of the finger joints are given in EN 14080 with reference standards. The shape of the finger joints in logs or log laminations needs not to follow EN 14080. The effect of the shape shall be taken into account in the testing and analysis.

Note In some member states the use of finger jointed monolithic and laminated logs in service class 3 is not allowed.

For wall and beam logs, the adhesives used shall comply with requirements given in EN 14080. Normally, the adhesives shall comply with Type I according to EN 301 or EN 15425.

For beam logs, the strength of the finger joints shall be given. The way how the shape of the finger joints has been taken into account shall be clarified in case of deviation from EN 14080.

2.2.4 Glue bond quality of laminated logs

Verification methods for adhesives for laminated logs are given in EN 14080 with reference standards (phenolic and aminoplastic adhesives or polyurethane adhesives) or ETAs for adhesives for load bearing timber structures.

Verification methods for glue bond quality of laminated logs are given in EN 14080 with reference standards. Glue bond quality is stated by a delamination test type A according to EN 391. In case of wall logs and in factory production control, also type B may be used.

Each gluing phase is considered separately with regard to delamination. For beam logs, the results are judged as provided for in EN 14080. For wall logs, the criteria used shall be given in the ETA.

Note A possible set of criteria contains the method, the requirement after first cycle and the requirement after the repeated cycle, together with a requirement for delamination of a single line, e.g: "The glue bond quality is stated by the delamination test according to EN 391, method B. The result is acceptable, if the total delamination of the glue lines is not more than 10 % after the first test cycle. If the total delamination exceeds 10 % after the first test cycle, the test will be repeated. The result is acceptable if the total delamination does not exceed 16 % after the repeated test cycle. Delamination of a single glue line shall not exceed 40 %."

2.2.5 Delivery moisture content

Moisture content shall be measured by electronic methods or be determined by weighing-drying method.

Note Moisture content is measured during manufacturing process. The manufacturer shall store the logs so that the moisture content during storage is kept within the announced limits. The products shall be stored at the place of works according to the instructions of the manufacturer so that the moisture content is not adversely changed.

Delivery moisture content and the tolerances of it shall be declared.

Mean moisture content of monolithic round logs shall not exceed 26 %, for rectangular logs 24 % and for laminated logs 18%. The delivery moisture content of logs that belong the same delivery shall be within ± 5 % from the declared one if the maximum thickness is more than 200 mm, and ± 4 % when thickness is less and for all laminated logs.

Note: The manufacturing process of the laminated logs may set closer requirements for the moisture content of the laminations.

2.2.6 Dimensional tolerances

The dimensions and shape shall be declared and measured in delivery moisture content defined by the manufacturer. Measurement and target values of all relevant dimensions and the tolerances of them shall be declared in the FPC documentation of the manufacturer. Measurement shall be done in a purposeful way that guarantees that the log is fit for the intended kit.

Note: The measurement method given in EN 1309-1 and the tolerances given in EN 336 are often not sufficient. Measurement may be done by a template or measurement jig that can be equipped with a gauge.

The measurement method shall be evaluated. ETA shall contain the main dimensions and tolerances and information about the effects of the moisture change to the dimensions. Control plan or a confidential part of the ETA shall contain detailed information regarding the shape of the blockings etc.

Note 1: Text in the ETA can thus be e.g. "Thickness and depth of logs shall not deviate more than ± 2 mm from the declared dimensions. The total length of the logs shall not deviate more than ± 5 mm from the declared length. For a measurement length of 2 m, twist shall not exceed the depth of log/20, the spring shall not exceed 10 mm and bow shall not exceed 17 mm."

Note 2: The logs will shrink during drying. The change of the moisture content of 5 % corresponds to about 1 % shrinkage in the radial direction; shrinkage in the tangential direction is double. This should be stated in the ETA.

2.2.7 Reaction to fire

Case 1: Products to be tested

Logs 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.

Case 2: Products classified without the need for further testing (CWFT)

Logs without surface treatments are considered to satisfy the requirements for performance class D-s2, d0 of the characteristic reaction to fire in accordance with the EC decisions 2003/593/EC and 2005/610/EC without the need for further 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 those products is D-s2, d0.

Note 1: Monolithic logs can be classified according to 2003/593/EC provided they have mean density of 350 kg/m³ and the thickness is at least 22 mm. Strength class C24 or better fulfils this requirement.

Note 2: Laminated logs can be classified according to 2005/610/EC provided they have mean density of 380 kg/m³ and the thickness is at least 40 mm. Strength class C30 or better fulfils this requirement.

Note 3: If the surface of the logs is rougher than for sawn or planed timber, e.g. hewn, logs shall be tested.

The product shall be classified according to EN 13501-1. Normally Case 2 is relevant, because this EAD does not deal with products for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification. As long as the exposed surface of the logs corresponds to sawn or planed timber, round logs can be classified as rectangular, because the seam structure of the log will not be exposed for fire in the finished wall.

Note: A European reference fire scenario has not been laid down for façades. In some Member States, the classification of logs according to EN 13501-1 might not be sufficient for the use in façades. An additional assessment of logs according to national provisions (e.g. on the basis of a large scale test) might be necessary to comply with Member State regulations or administrative provisions, until the existing European classification system has been completed.

2.2.8 Resistance to fire

The part of the works or assembled system in which the logs are intended to be incorporated, installed or applied shall be tested and classified according to the appropriate part of EN 13501. The test method relevant for the corresponding fire resistance class shall be used.

When relevant, for the purpose of classification of the works according to calculation, reference to EN 1995-1-2 can be given.

2.2.9 Content, emissions and/or release of dangerous substances

After identifying the release scenarios taking into account the intended use of the product:

- 1) The assessment of the product will be made by resorting to already existing European assessment methods developed by CEN (or by EOTA, if CEN has not yet developed such methods).
- 2) If European assessment methods as mentioned above do not yet exist and if the manufacturer wants to have his product used in a Member State which has requirements on the assessment of the performance of the product concerning dangerous substances, the national assessment method applicable in that specific Member State will be taken into account when choosing the assessment method.

In case that logs are not solely made of timber:

Formaldehyde

The formaldehyde release of the logs and/or constituents of the logs shall be determined according to the test standard EN 717-1, if raw materials containing formaldehyde are used in the production process.

Class for the formaldehyde emission of the logs shall be given. Logs, produced with an adhesive, which does not contain formaldehyde, may be assigned to class E1 without testing.

or

If there are no ingredients which could release formaldehyde in the product, a statement regarding this shall be given.

Wood preservatives

For the assessment, the manufacturer shall provide a copy of the REACH information or declarations he is obliged to do by other EU legislation.

The content of PCP shall be stated in the ETA if the manufacturer intends to declare this aspect.

2.2.10 Water vapour permeability

Water vapour resistance factor μ shall be determined according to EN ISO 12572 or values in EN ISO 10456 can be used.

It shall be proven that the adhesive used for gluing laminated logs has no adverse effect on the moisture transfer in the log. Statement regarding the effect of the glue lines shall be given e.g. by declaring how thick a timber layer the glue line corresponds to. The assessment can be based on experience if similar or corresponding products have been in use during a longer time without problems related to moisture transport through the glue line. This shall be stated in the ETA, e.g. as:

"According to experience, the glue lines of the laminated logs do not have an adverse influence on the moisture transport in the logs."

2.2.11 Impact resistance

This characteristic applies for wall logs in cases that there are no finger joints or laminations, or the glued joints are not subject for shear stress. In addition, the resistance of the logs shall be much larger than the stresses caused by the intended use. In some MS there may be the situation that no calculations regarding mechanical properties are required for log buildings that are smaller than specified in the local regulations.

For wall logs that contain finger joints and laminated logs, the properties of the finger joints shall be assessed as described in 2.2.3 and the glue bond quality of laminated logs shall be assessed as described in 2.2.4.

When quantified performance is needed, the test methods for soft body impact given in EOTA TR 001 can be applied. The wall to be tested shall contain typical features for the construction in intended kit use, e.g. dowels, sealing strips and cross corners. When the assessment is based on tests according to EOTA TR 001, the classification in ETAG 003 should be used.

When the assessment is based on experience, this shall be stated in the ETA, e.g. as:

"According to long term experience, log wall bears the impact caused by falling humans without structural damage."

2.2.12 Thermal conductivity and thermal transmittance

Thermal transmission values in EN ISO 10456 can be used or properties can be determined according to EN 12667.

Thermal conductivity λ [W/(m K)] shall be given.

In absence of measurements, λ value 0,12 W/(m K) can be used for all types of logs. This value takes into account the shape and normal cracks of the log. This shall be stated in the ETA, e.g. as:

"When the thermal transmittance of the logs is calculated, the nominal thickness value of rectangular logs and the mean thickness value of round logs are used. Thermal transmittance is not increased by cracks the opening of which do not exceed 8 mm and which are not through the log."

Thermal conductivity depends on moisture content of the logs. A statement regarding this shall be given in the ETA:

"The value above refers to ordinary moisture conditions as specified in EN ISO 10456. Corrections due to different moisture content of the logs shall be taken in account in the design according to national provisions, when required".

2.2.13 Thermal inertia

Specific heat capacity (c_p) value 1600 J/(kg K) given in EN ISO 10456 can be used for all types of logs and given in the ETA together with the mass per meter of the logs.

2.2.14 Dimensional tolerances

The dimensions and shape shall be declared and measured in delivery moisture content defined by the manufacturer. Measurement and target values of all relevant dimensions and the tolerances of them shall be declared in the FPC documentation of the manufacturer. Measurement shall be done in a purposeful way that guarantees that the log is fit for the intended kit.

Note: The measurement method given in EN 1309-1 and the tolerances given in EN 336 are often not sufficient. Measurement may be done by a template or measurement jig that can be equipped with a gauge.

The measurement method shall be evaluated. ETA shall contain the main dimensions and tolerances and information about the effects of the moisture change to the dimensions. Control plan or a confidential part of the ETA shall contain detailed information regarding the shape of the blockings etc.

Note 1: Text in the ETA can thus be e.g. "Thickness and depth of logs shall not deviate more than ± 2 mm from the declared dimensions. The total length of the logs shall not deviate more than ± 5 mm from the declared length. For a measurement length of 2 m, twist shall not exceed the depth of log/20, the spring shall not exceed 10 mm and bow shall not exceed 17 mm."

Note 2: The logs will shrink during drying. The change of the moisture content of 5 % corresponds to about 1 % shrinkage in the radial direction; shrinkage in the tangential direction is double. This should be stated 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:

- for monolithic logs Decision 1997/176/EC, product family (1/3)
- for laminated logs decision 1997/176/EC, product family (2/3) ²

The systems to be applied are: **1 or 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 2a and 2b.

² According to the Mandate M112, Structural timber products and ancillaries, Annex 3, for products under systems 1, regarding the initial type testing of the product, the task of the approved laboratory will be limited to the assessment of the Euroclass characteristics for reaction to fire and bonding strength.

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 logs are laid down in Table 3a and 3b.

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	Incoming materials	2.2.1	control plan	1	each incoming lot
2	Manufacturing processes	3.4.2	control plan	1	each manuf. lot ³
3	Delivery moisture content	2.2.12	control plan	1	each manuf. lot
4	Dimensional tolerances	2.2.15	control plan	1	each manuf. lot

³ Manufacturing lot means logs for one kit or logs produced during one shift on one production line.

Table 2b Control plan for the manufacturer; corner stones. Logs with gluing processes

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	Incoming materials	2.2.1	control plan	1	each incoming lot
2	Manufacturing processes	3.4.2	e.g. gluing records	1	each manuf. lot
3	Delivery moisture content	2.2.12	control plan	1	each manuf. lot
4	Dimensional tolerances	2.2.15	control plan	1	each manuf. lot
5	Finger joints in beam logs, strength	2.2.3	control plan	3	each shift and line
6	Glue bond quality of laminated logs EN 14080 and EN 391 delamination test Method A or B	2.2.4	control plan	1	each shift and line

Table 3a Control plan for the notified body; corner stones. Logs made without gluing processes

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control (for system 2+)					
7	Initial inspection of factory	3.4.2	control plan	N/A	N/A
8	Initial inspection of factory production control	3.4.1 3.4.2	control plan	N/A	N/A
Continuous surveillance, assessment and evaluation of factory production control (for system 2+)					
9	Production control in general	3.4.1 3.4.2	control plan	N/A	2/year

Table 3b Control plan for the notified body; corner stones. Logs made with gluing processes

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control <i>(for system 1)</i>					
7	Initial inspection of factory	3.4.2	control plan	N/A	N/A
8	Initial inspection of factory production control	3.4.1 3.4.2	control plan	N/A	N/A
Continuous surveillance, assessment and evaluation of factory production control <i>(for system 1)</i>					
9	Production control in general	3.4.1 3.4.2	control plan	N/A	2/year
10	Finger joints in beam logs, strength	3.4.1 3.4.3	control plan	N/A	2/year
11	Glue bond quality of laminated logs EN 14080 and EN 391 Method A or B	3.4.1 3.4.4	control plan	N/A	2/year

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

3.4.1 Incoming materials

Incoming materials are timber, adhesive, log blanks or laminated log blanks. Timber shall be checked as provided for in EN 14081-1 or EN 14080 depending on whether it is glued or not by the log manufacturer. Any adhesive used shall be checked as provided for in EN 14080.

Specific requirements for the incoming materials shall be set in the control plan. In case that the manufacturer wants to change the adhesive of laminated logs or load bearing finger joints within the same adhesive type as indicated in the ETA, the Notified body shall carry out a new initial type testing.

If the manufacturer buys blanks, he shall ensure that the manufacturer of blanks has adequate factory production control methods and that the blanks fulfil the requirements set in the control plan. The Notified Body shall have access to the facilities of the blanks manufacturer, when considered necessary. This shall be stated in the control plan.

3.4.2 Manufacturing processes

The manufacturer shall define the manufacturing process adequately in relation to the equipment he has and the product to be manufactured. The main product groups are monolithic wall logs, monolithic beam logs, laminated wall logs and laminated beam logs. Within these groups logs may be round or rectangular and shaping of them, as blockings, may be done by several kinds of equipment.

The manufacturer shall exercise permanent internal control of manufacturing processes. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product will be in conformity with the ETA issued on basis of this EAD.

Regarding grading of the material, principles of EN 14081-1 shall be applied. Regarding structural gluing, principles of EN 14080 shall be applied.

Gluing records shall be kept regarding all processes that contain gluing, whether structural or not.

3.4.3 Finger joints in beam logs, strength

In factory production control, strength of finger joints shall be tested as provided for in EN 14080.

The test results shall fulfil the values given in the control plan.

3.4.4 Glue bond quality of laminated logs

In factory production control, glue bond quality of laminated logs shall be tested as provided for in EN 14080 and EN 391, delamination test Method B.

The test results shall fulfil the values given in the control plan. For laminated beam logs, the requirements shall be same as for glued laminated timber set in EN 14080. For wall logs, individual requirements can be set.

3.4.5 Dimensional tolerances

The manufacturer shall define check points for the dimensions in the manufacturing process. He shall also define how the measurements shall be done. All relevant measurements shall be recorded in dimension records. Checks shall be made e.g. when tools are changed.

When the log profile or the blocking profile is changed, one cross corner should be made and checked for the dimensions to be adequate.

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.

EN 301	Adhesives, phenolic and aminoplastic, for load-bearing timber structures. Classification and performance requirements
EN 336	Structural timber - Sizes, permitted deviations
EN 338	Structural timber - Strength classes
EN 350-2	Durability of wood and wood-based products. Natural durability of solid wood. Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe
EN 384	Structural timber. Determination of characteristic values of mechanical properties and density
EN 391	Glued laminated timber. Delamination test of glue lines
EN 408	Timber structures. Structural timber and glued laminated timber. Determination of some physical and mechanical properties
EN 717-1	Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method
EN 1309-1	Round and sawn timber - Method of measurement of dimensions - Part 1: Sawn timber
EN 1912	Structural timber — Strength classes — Assignment of visual grades and species
EN 1995-1-1	Eurocode 5: Design of timber structures. Part 1-1: General. Common rules and rules for buildings

EN 1995-1-2	Eurocode 5: Design of timber structures - Part 1-2: General -Structural fire design
EN ISO 10456	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456)
EN ISO 12572	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties (ISO 12572:2001)
EN 12667	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hotplate and heat flow meter methods - Products of high and medium thermal resistance
EN 13501-1	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN 14080	Timber structures. Glued laminated timber. Requirements
EN 14081-1	Timber structures. Strength graded structural timber with rectangular cross section. Part 1: General requirements
EN 14358	Timber structures - Calculation of characteristic 5-percentile values and acceptance criteria for a sample
EN 14915	Solid wood panelling and cladding - Characteristics, evaluation of conformity and marking
EN 15425	Adhesives. One component polyurethane for load bearing timber structures. Classification and performance requirements.
EOTA TR 001	Determination of impact resistance of panels and panels assemblies
EOTA TR 002	Test methods for light composite wood-based beams and columns
ETAG 003	Internal partition kits for use as non-loadbearing walls