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Traditionally designed prefabricated stairs made of solid wood — Specifications and requirements

ICS 91.060.30

National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Traditionell konstruierte, vorgefertigte Treppen aus Massivholz - Spezifikationen und Anforderungen

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Foreword

This document (EN 15644:2008) has been prepared by Technical Committee CEN/TC 175 “Round and sawn timber”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2009, and conflicting national standards shall be withdrawn at the latest by June 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This standard is divided into parts:

- Clauses 4 and 5: General questions;

- Clauses 6 to 11: Applications to stairs made of solid wood.

If a general standard on stairs is developed and adopted, Clauses 4 and 5 of this document will be reconsidered to be aligned with the general standard, if needed.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard gives specifications and requirements for prefabricated stairs made of solid wood, i.e. where the components contributing to the fulfilment of mechanical resistance and stability characteristics are made of solid wood. These stairs are traditionally designed.

NOTE 1 If the filling of the guarding does not contribute to the mechanical stability and resistance, the used material is not relevant.

NOTE 2 Examples of traditionally made/designed stairs are given in Annex E.

This European Standard covers: stairs either pre-assembled, partly pre-assembled or in component form including balustrades and handrails for internal or external use.

This European Standard does not consider the contribution of these elements to the overall structure design. The ability of a stair to contribute to the overall stability of the works or to the strength of the structure is not covered by this standard.

Carpets on stairs are not covered by this Standard.

The surfaces of the wooden elements may be exposed or covered by finishes.

Where stairs are supplied with a finish or covering, aesthetic or visual characteristics will not be covered by this Standard and references shall be made to the appropriate product standard (e.g. colour fastness of carpet finishes).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 335-2:2006, *Durability of wood and wood–based products — Definition of use classes — Part 2: Application to solid wood*

EN 350-1, *Durability of wood and wood-based products – Natural durability of solid wood – Part 1: Guide to the principles of testing and classification of the natural durability of wood*

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 351-1, *Durability of wood and wood–based products — Preservative–treated solid wood — Part 1: Classification of preservative penetration and retention*

EN 599-1, *Durability of wood and wood–based products — Efficacy of preventive wood preservatives as determined by biological tests — Part 1: Specification according to use class*

EN 599-2*, Durability of wood and wood–based products — Performance of preventive wood preservatives as determined by biological tests — Part 2: Classification and labelling*

EN 1121, *Doors - Behaviour between two different climates - Test method*

EN 1294, *Door leaves - Determination of the behaviour under humidity variations in successive uniform climates*

EN 1365-6, *Fire resistance tests for loadbearing elements - Part 6: Stairs*

EN 1534*, Wood and parquet flooring – Determination of resistance to indentation (Brinell) – Test method*

EN 1990, *Eurocode – Basis of structural design*

EN 1995-1-1, *Eurocode 5 - Design of timber structures – Part 1-1: General – Common rules and rules for buildings*

ENV 1998-1-2:1994, *Eurocode 8 – Design provisions for earthquake resistance of structures – Part 1-2: General rules – Generals rules for buildings*

EN 12219, *Doors – Climatic influences – Requirements and classification*

EN 12600, *Glass in building – Pendulum test. Impact test - method and classification for flat glass*

EN 13442, *Wood and parquet flooring and wood panelling and cladding – Determination of the resistance to chemical agents*

EN 13501-1:2007, *Fire classification and construction products and building elements – Part 1: Classification using data from reaction to fire tests*

EN 13647, *Wood and parquet flooring and wood panelling and cladding – Determination of geometrical characteristics*

EN 13696, *Wood flooring – Test methods to determine elasticity and resistance to wear and impact resistance*

EN 13986, *Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking*

EN 14076:2004*, Timber stairs — Terminology*

CEN/TS 15680, *Prefabricated timber stairs – Mechanical test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14076:2004 and the following apply.

3.1
overlap
horizontal distance (o) between the nosing of a tread that covers the rear edge of the immediate lower tread (see Figure 4)

3.2
calculation
assessment of characteristics (for example mechanical resistance, stability, etc.) using formulae of appropriate design models for the structural behaviour of stairs and components including the use of tabulated values (for some characteristics, Eurocodes are relevant)

3.3
traditionally-designed prefabricated stair
stair made of solid wood with steps with or without riser, housed on both ends into strings, either close string(s) and/or cut string(s)

NOTE Fixing of steps on both ends in/on strings indicates a design of steps as single-span beam (examples given in Annex E).

3.4
solid wood
wood sawn or otherwise machined which may include finger jointed and/or laminated wood (as defined in EN 335-2)

NOTE A decorative veneer may be used if the hidden parts are made of solid wood.

3.5
historical data
test results following the provisions of the product technical specification, obtained before it was in force and complying with this technical specification (see Guidance Paper M:May 2005)

3.6
stair made of solid wood
components (steps, strings, guarding/railing, etc.) which contribute to the fulfilment of mechanical resistance and stability characteristics (vertical and horizontal) are of solid wood

3.7
classified without the need further testing
CWFT
procedure by which the level of performance of a product is initially demonstrated by testing, in such a way that manufacturers may refer to that performance without the need of further tests (see Guidance Paper M:May 2005)

3.8
conventional accepted performance
CAP
provisions presented or referred to in the technical specification that allows manufacturers to declare product performances without the need to perform initial type tests, calculations, etc. such as tabulated values, descriptive solutions and alike (see Guidance Paper M :May 2005)

3.9
balustrade
safety barrier that shall prevent a person falling from the stair or being trapped.

3.10
walking line
theorical line indicating the average path of the user of the stair

4 General principles

4.1 Classification

4.1.1 General

For the purpose of this standard, 3 systems are considered: climatic conditions, traffic frequency and comfort.

For each performance given in the clauses below, a verification method is given in Clause 5.

4.1.2 Climatic conditions (location)

The intended use (location) is defined in the following Table 1:

Table 1 — Climatic conditions

Internal	- for space with room temperature below 12 °C - for space with room temperature included between 12 °C and 21 °C - for space with room temperature over 21 °C
External	No subclasses NOTE Border values are given in 5.6.2.

Specific climatic conditions relevant for wooden stairs are given in Clause 6.

4.1.3 Traffic frequency

The material used in the stairs shall take into account the intended use (frequency: F_x):

— F_1 (low traffic): typical use: domestic: 1 – 10 persons using the stair in the building;

— F_2 (moderate traffic): typical use: domestic and/or commercial: 10 - 20 persons;

— F_3 (high traffic): typical use: public and industrial: more than 20 persons.

4.1.4 Comfort

There are different aspects of the comfort, for example: number of steps, the clear width, the pitch.

Classifications exist concerning comfort. These classifications can rely on the relation between rise and going. Following this relation, the stairs can be tight, ordinary or comfortable.

Another way to classify the comfort is the modulus given by the relation g (going) + 2 r (rise). If no national regulation exists, this relation shall be between 580 mm and 660 mm.

4.2 Performance characteristic required

4.2.1 General

NOTE 1 This clause is necessary mostly to take into account the existing laws or regulations or administrative provisions enforced for some buildings and or for some European countries or for particular cases.

The following aspect(s) of performance(s) are relevant.

NOTE 2 Methods for verification and assessment can be found in Clause 5.

4.2.2 Mechanical resistance and stability

4.2.2.1 Load bearing capacity

The prefabricated stair shall have sufficient mechanical resistance and stability to withstand static or dynamic loads from the actions (permanent, variable and accidental) without reaching its serviceability limit state. The actions shall be in accordance with the laws, regulations and administrative provisions, applicable for the location where the product is incorporated in the works.

4.2.2.2 Design provisions for earthquake resistance

In seismic zones, the product, together with the fixing, may be able to resist to seismic actions, when relevant.

4.2.2.3 Stability and stiffness

Stability and stiffness are expressed as load-displacement behaviour and vibrations.

The stair as a whole and its parts, such as steps and barriers, shall be designed to limit the deflection and vibrations under working conditions.

4.2.2.4 Resistance of fixings

The fixings to the supporting structure and the connection of the stair components to each other shall be designed in such a way that the actions from the different parts of the prefabricated stair shall be transferred to the supporting structure in an appropriate way.

4.2.3 Safety in case of fire

4.2.3.1 Resistance to fire

The load bearing capacity needs to be evaluated, when relevant.

4.2.3.2 Reaction to fire

Material, which is part of the prefabricated stairs, shall have the necessary performance concerning reaction to fire in accordance with laws, regulations and administrative provisions applicable to the prefabricated stairs in the end use situation.

4.2.4 Hygiene, health and environment (dangerous substances)

4.2.4.1 General

For components of prefabricated stairs, the following aspects of performance are relevant.

In so far as the state of the art permits, the manufacturer shall establish those materials in the product which are liable to emission or migration during normal intended use and for which emission or migration into the environment is potentially dangerous to hygiene, health or the environment. The manufacturer or importer shall establish and make the appropriate declaration of content according to the legal requirements in the intended state of destination.

NOTE An informative database of European and national provisions on dangerous substances is: http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm

4.2.4.2 Release of formaldehyde

The components shall be made of concerned materials and the concerned surface treatments shall be made, in order that release of formaldehyde is in accordance with laws, regulations and administrative provisions, applicable for the location where the product is incorporated in the works.

4.2.4.3 Content of pentachlorophenol (PCP)

The components shall be made of such materials and the surface treatments shall be made, in order that the content of pentachlorophenol is in accordance with laws, regulations and administrative provisions, applicable for the location where the product is incorporated in the works.

4.2.4.4 Content of asbestos

The components shall be made of such materials that the content of asbestos is in accordance with laws, regulations and administrative provisions applicable for the location where the product is incorporated in the works.

NOTE See Council Directive 91/382/EEC of 25 June 1991 amending Directive 83/477/EEC and Council Directive 87/217/EEC of 19 March.

4.3 Geometry of stairs and safety in use

4.3.1 Geometry of stairs including landings

Prefabricated stairs, including landings, shall be normally accessible and safe during their daily use and function as main escape in the case of fire where required.

The dimensions listed below are related to varying (minimum and/or maximum) requirements set out in the relevant laws, regulations and administrative provisions applicable for the location where the product is incorporated in the works. For stairs to be used by special groups (e.g. handicapped people, children), specific values for these will have to be met.

— length;

— height;

— width;

— going – rise;

— pitch / constant pitch line;

— overlap;

— number of rises between landings;

— maximum openings (the size and shape of the openings shall be such that a person is prevented from falling from the stair or being trapped);

— clear width of stair (maximum and/or minimum);

— minimum headroom (in cases where the minimum headroom is relevant for the stair itself (e.g. spiral stair), this performance characteristic shall be considered);

— dimensions of landing.

4.3.2 Slipperiness

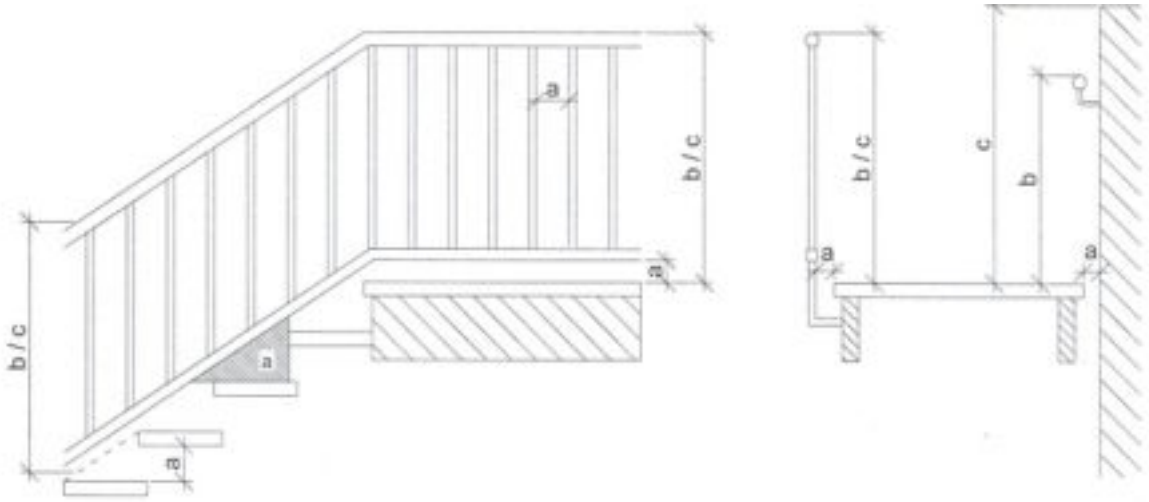
The slipperiness of steps and landings is dependent on the surface treated or untreated and has to be evaluated. Unsafe final surface shall be avoided.

NOTE Surface layers like carpets can be used. They will modify the product against slipperiness.

4.3.3 Safety equipment

4.3.3.1 Openings

Openings created in a stair shall be designed to reduce the risk of injury e.g. by entrapment maintaining the safety in use of the stair.



Key

a openings

b height of handrail

c height of balustrade

Figure 1 — Balustrade and handrail

4.3.3.2 Handrails

4.3.3.2.1 Height of the handrail

The height of the handrail and additional handrail for children shall ensure that the user can firmly grasp and use the handrail in all cases in an appropriate way (Figure 1).

The heights of the handrails shall comply with the different requirements set out in the relevant laws, regulations and administrative provisions, applicable for the location where the product is incorporated in the works, to allow users to go up and down safely.

4.3.3.2.2 Geometry of the handrail

The performance of the handrail and its end shall be such that the user can firmly grasp and use the handrail in an appropriate way. The gap between the wall and the handrail (a) shall be sufficient to enable the safe use of the handrail (Figure 2).

Additional handrails shall be provided if demanded.

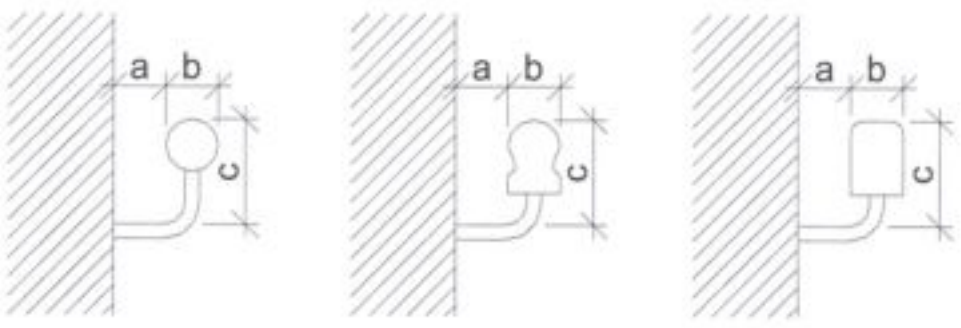


Figure 2 — Examples of handrails

The free side distance (a) shall be clear for the full length of the handrail (fixings shall not interrupt normal finger contact (c). See Annex A, Clause A.1.2.

The handrails shall be smooth without sharp or cutting or projections for areas in normal hand contact.

4.3.3.3 Balustrades

4.3.3.3.1 Height of balustrade and minimum and maximum height of the part of the balustrade without ladder effects (e.g. openings, decorative elements)

The height of the balustrade and the height of the part of the balustrade without ladder effect shall comply with different requirements set out in the relevant laws, regulations and administrative provisions, applicable for the location where the product is incorporated in the works to allow users to go up and down safely.

4.3.3.3.2 Climbability for infants

Depending on the intended use and the local regulations where the product is incorporated in the works, there may be a requirement to prohibit the ladder effect. The ladder effect means that some components of the balustrade make it possible for infants to climb up (ladder effect) the balustrade.

To minimise the ladder effect, for example, the maximum diameter of openings of the balustrade in-fill and of the in-fill elements of the associated parts of the balustrade shall comply with the different requirements set out in the relevant laws, regulations and administrative provisions, applicable for the location where the product is incorporated in the works.

4.3.3.4 Tactility and visibility

For some applications, there may be a need of specific safety equipment to enable disabled people, children or elderly people to use the stairs. Tactility for blind people as well as the visibility for all users of the stairs shall be considered.

The safety equipment shall be such that the beginning and the end of the stairs and the handrail can be observed clearly. The edge of the steps and landings shall be marked clearly, this marking shall not increase the slipperiness of the stairs.

4.3.4 Safe breakage

In normal use, regardless of whether the parts contribute to the mechanical resistance and stability of the stairs as a whole or not (e.g. infilling component of a balustrade or guard-rail), the stairs shall be designed and installed with due consideration to passive safety to prevent occupants from being injured by the stairs or part of the stairs. In the case of a person falling against the stairs or balustrade, the possible injuries shall be limited. Also, in the case of an accident, the injury caused to persons below or in the neighbourhood of the stairs shall be limited.

Any elements of the stair liable to brittle fracture failure shall not, when accidentally broken, be a danger to users. Materials shall be such that, when broken, the pieces are kept in place and not detached in a way which would endanger users and those passing by.

4.3.5 Impact resistance

The properties of the construction and the materials shall be such that the element is resistant to dynamic loads from persons or objects accidentally falling against the balustrade or on the stairs.

4.4 Protection against noise

Where sound insulation or sound absorption is called for, the insulation is added during the installation and is not part of the stair construction.

4.5 Energy economy

Where thermal insulation is relevant, the insulation shall be applied afterwards and not be part of the product.

4.6 Aspects of durability, serviceability and identification

4.6.1 General

The components and materials used in prefabricated stairs are defined by their properties.

To retain their properties during the working life, the components of the stairs and surfaces may need regular maintenance. The maintenance of applied coatings and finishes shall be specified in accompanying documents. This may be especially important for outdoor stairs and stairs in public buildings.

4.6.2 Resistance to deterioration caused by climatic conditions

The stairs and the parts of them, especially joints, shall not be adversely affected (deteriorated, distorted or deformed) by the following conditions:

— variations of temperature of the environment;

— variations of relative humidity of the environment;

— radiation of the sun, if necessary.

4.6.3 Resistance to deterioration caused by chemical agents

The stairs and the parts of them, especially joints, shall not be adversely affected by the following chemical agents:

— cleaning agents;

— water, and

— naturally occurring corrosives.

4.6.4 Resistance to deterioration caused by biological agents

The stairs and the parts of them, especially joints, shall not be adversely affected by the following biological agents:

— fungi;

— insects.

4.6.5 Finishes

The finishes of the stairs shall protect against deterioration caused by climatic conditions, chemical or biological agents, when relevant. The finishes shall not increase the slipperiness of the stairs beyond safe limits.

NOTE Safe limits can be given in national regulations for several end uses.

If other functions of surface finishes are claimed, they shall be proven.

5 Methods of verification and assessments

5.1 Performance characteristics and verification methods

5.1.1 General

The relevant requirements to product performances (as given in Clause 4) are assessed and tested as given in the following Table 2 in accordance with conventionally accepted performance (provisions presented or referenced in technical specifications) or by calculation or by testing. Table 3 gives information regarding additional performance characteristics.

Table 2 — Table linking essential requirements to performance characteristics and verification methods

ER [a]	Paragraph and product characteristics	Product characteristics	Paragraph on verification method
1	4.2.2.1 Load bearing capacity	Resistance to structural damage from vertical and horizontal loads against the barrier	5.1.2 Mechanical resistance and stability
	4.2.2.2 Earthquake resistance	Seismic action	5.1.3 Design provisions
	4.2.2.3 Stability and stiffness	Stiffness	5.1.4 Load / displacement behaviour and vibrations
	4.2.2.4 Resistance of fixings	Resistance to structural damage of fixings	5.1.5 Resistance of fixings
2	4.2.3.1 Resistance to fire 4.2.3.2 Reaction to fire – horizontal parts – all other parts	Load bearing capacity R Euroclasses decision	5.2.1 Resistance to fire (wood: 7.4.1) 5.2.2 Reaction to fire (wood: 7.4.2)
3	4.2.4 Hygiene, health and environment 4.2.4.2 Release of formaldehyde 4.2.4.3 Content of Pentachlorophenol 4.2.4.4 Content of asbestos	Class of release Level or content	For timber: 7.5.1 Release of formaldehyde (wood: 7.5.2)
4	4.3.1 Geometry of stair including landings	Definition of geometry	5.3.1 Geometry of the stair including landings
	4.3.2 Slipperiness	Slipperiness of the surface materials of the steps and landings	5.3.2 Slipperiness (wood: 7.6.2)
	4.3.3 Safety equipment	Adequate function	5.3.3 Safety equipment
	4.3.4 Safe breakage	Geometry and shattering properties of glass and other materials	5.3.4 Safe breakage (wood: 7.11)
	4.3.5 Impact resistance	Resistance to structural damage from soft body, hard body and angular body impact load	5.3.5 Impact resistance

[a] ER: Essential requirements

Table 3 — Additional performance characteristics and verification methods

Aspects of durability serviceability and identification	4.6.2 Resistance to deterioration caused by climatic conditions	5.6.2 Resistance to deterioration caused by physical agents
	4.6.3 Resistance to deterioration caused by chemical agents	5.6.3 Resistance to deterioration caused by chemical agents (wood: 7.9.3)
	4.6.4 Resistance to deterioration caused by biological agents	5.6.4 Resistance to deterioration caused by biological agents (wood: 7.8.3)
	4.6.5 Finishes and surface layers	5.6.5 Finishes and surface layers Resistance to deterioration caused by physical, chemical or biological agents Specific functions

5.1.2 Mechanical resistance and stability

The mechanical load bearing capacity of the stairs is a matter of safety so that the stairs will not be damaged in use.

The load bearing capacity and the load-displacement behaviour and vibrations of the stair as a whole or of its parts (including fixings) shall be verified according to the limit states design method as proposed in EN 1990, if not otherwise stated in the national regulations.

The verification shall be made on basis of CAP[1)] (presented or referred in technical specifications), by calculation, or by testing (CEN/TS 15680):

- *Verification by CAP and/or calculation*

Using the appropriate standard [2)] giving formulae, tables and design values and/or calculations in line with appropriate Eurocodes.

- *Verification by calculation*

All calculation methods in line with the appropriate Eurocode are relevant.

- *Verification by testing for evidence*

Where the tables or calculation methods are not sufficient or not appropriate, testing shall be carried out to substantiate the performance of the stair (CEN/TS 15680 gives some relevant tests).

The same principle applies for other materials and combinations of materials, provided a relevant calculation method is used. In specific cases and where calculation methods are not appropriate, the design can be based on test data.

1) CAP is the Conventional Accepted Performance

2) CEN/TC 175/WG3/TG7 is preparing a draft concerning this subject (WI 00175121).

The test procedures in general shall follow the relevant EN standards for testing product components and materials.

5.1.3 Design provisions for earthquake resistance

The stair element, and the fixings to the main structures, shall be verified to resist the seismic action and its combination with the relevant permanent and variable actions.

NOTE The stair manufacturer is responsible for the information about the dead load which is submitted by the stair to the works. He is not responsible for the performance of the work with respect to loads given by the stair.

The verification shall be made according to Clause 3.5 of EN 1998-1-2:1994, including the boxed values given in this standard or in the national application documents.

5.1.4 Load/displacement behaviour and vibrations

Under service loads, the deflection of the stairs on the wall free side shall be given related to the median line of the flight. The deflection shall not exceed the value given in Eurocode 5 or possible national Annex of EC 5. Bending, due to imposed horizontal load shall not be taken into account here. Test methods are given in CEN/TS 15680.

NOTE In the future, tests or calculation methods could be completed by conventional tabulated values. For some characteristics, these conventional tabulated values could replace tests and/or calculation.

The function of the wall fastener as well as the shear resistance of the steps shall be taken into account. The influence of the railing may be taken into account. For the railing, a verification of bending due to imposed horizontal loads will generally not be required.

The proper oscillation frequency of stairs exposed to dead load as well as to an additional single load of 1 kN acting on the most unfavourable point shall be given. Usually, this value shall not be smaller than < 5,0 Hz. Alternatively, the lowest natural frequency shall be given.

5.1.5 Resistance of fixings

If necessary, the manufacturer shall give all information about the loads coming from the stair for determination of fixings to the building.

5.2 Safety in case of fire

5.2.1 Resistance to fire

For resistance to fire, the evaluation for the R-characteristics shall be made as specified in EN 13501-*2,* and if relevant, using test methods EN 1365-6. Resistance to fire may also be evaluated by calculation.

The convenient class(es) for stair is to be found out by the manufacturer in accordance with the requirements for the intended use.

The manufacturer shall ensure that the elements used in the finished stair product remain the same or do not change to an extent which would change the values obtained for load bearing capacity.

5.2.2 Reaction to fire

An evaluation and classification shall be made as specified in EN 13501-1 (see Annex D). For some materials and products, there are CWFT principles.

5.3 Safety in use

5.3.1 Geometry on the stair including landings

5.3.1.1 General

Tolerances are possible on nominal values and shall be declared by the manufacturer. Maximum values for tolerances for going and rise, see Clause 4.1.4.

The stair geometry parameters including landings are determined in the following clauses.

5.3.1.2 Going

The going shall be the horizontal distance between the nosing of two consecutive steps measured on the walking line.

5.3.1.3 Minimum going for tapered steps

The minimum going shall be given and measured as the minimum unobstructed horizontal distance between the nosing of two consecutive tapered steps projected on plan.

5.3.1.4 Maximum going for tapered steps

The maximum going shall be given and measured as the maximum unobstructed horizontal distance between the nosing of two consecutive tapered steps projected on plan.

5.3.1.5 Rise

The distance shall be given and measured vertically from the surface of a tread of a step to the tread of the consecutive step.

When there is more than one designed value for rise within the same flight, e.g. for the first step, this shall be declared.

5.3.1.6 Pitch

The pitch of all steps in one flight shall be measured and expressed as the angle in degrees between the pitch line and the horizontal plane.

5.3.1.7 Constant pitch line

The location of the constant pitch line should be indicated on the plan drawing of the stair, and the pitch values along this line shall be measured.

5.3.1.8 Overlap

The dimension of the overlap shall be measured horizontally on plan between the nosing of a step and the rear edge of the tread of the consecutive step below and value indicated.

5.3.1.9 Number of rises between landings

The rises within one flight shall be declared.

5.3.1.10 Maximum openings

The size of the openings shall be measured or analysed and tested with a cube with a fixed edge length. The length of the edges of the cube shall be such that the cube cannot be put through the opening in any position. The edge length of this cube can also be calculated from the three-dimensional geometry of the opening.

Alternative to the cube test, a test may be carried out with a sphere. However, the cube edge length and/or the sphere diameter shall always be given in the method used.

NOTE The measured value by cube and by sphere are not equivalent. Depending on the shape of the opening, the sphere might be the one that can be fitted inside the cube or the one that embraces the cube or something in between.

The following openings shall be considered when relevant:

- between balustrade and other parts of stair (see Figure 1 – Clause 4.3.3.1);
- between consecutive steps in an open rise stair (Figures 3 and 4);
- in the balustrade (see Figure 1).

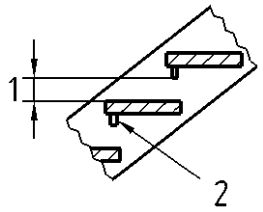


Figure 3 — Listel riser step

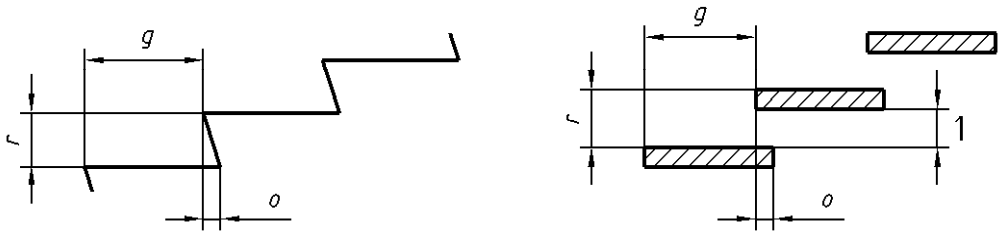


Figure 4 — Rise (r), going (g), overlap (o)

5.3.1.11 Clear width of stair

The distance (maximum and minimum) shall be measured perpendicular to the walking line on plan between (restricting) elements as shown in EN 14076 (Figure 2).

5.3.1.12 Minimum headroom

In cases when relevant, the distance shall be measured in vertical planes above the pitch of the stair.

5.3.1.13 Dimensions of landings

The dimensions of the landings shall be measured so that the shape of the landings can be specified e.g. by a drawing.

5.3.2 Slipperiness

The slipperiness and the test method shall be declared, if relevant.

NOTE 1 Slipperiness can be determined according to CEN/TS 15676.

NOTE 2 If no national regulations in the final destination, the declared value can be NPD (No Performance Declared).

5.3.3 Safety equipment

5.3.3.1 Handrails

5.3.3.1.1 Height of the handrail

The height of the handrail and any additional handrail for children shall be measured vertically from the top of the handrail and the nosing of the step or landing (see Figure 1).

5.3.3.1.2 Geometry of the handrail

Geometry of handrails and the gap between wall and handrail shall be verified by general examination with respect to Figure 2.

5.3.3.2 Balustrade

5.3.3.2.1 Height of balustrade

The height of the balustrade shall be measured vertically from the nosing of the step or upper surface of the landing to the upper surface of the balustrade (see Figure 1).

5.3.3.2.2 Minimum and maximum border height of the part of the balustrade without openings and elements which may assist climbing

The height of the relevant part of the balustrade shall be measured vertically from the nosing or upper surface of the landing to the upper surface of the balustrade.

5.3.3.2.3 Climbability for infants

The openings and elements which assist climbing in the balustrade and the filling elements themselves shall be verified. The minimum and maximum border height of the relevant part of the balustrade shall be assessed, verified and measured vertically.

5.3.3.3 Tactility and visibility

If relevant, tactility and visibility shall be proven according to the methods to be developed by CEN or national rules as long as CEN methods are missing.

5.3.4 Safe breakage

The breaking properties of the flat components of brittle materials shall be proven according to EN 12600.

For materials other than glass, the test requirements for safe breakage shall be formulated in a comparable way:

a) no shear or opening develops within the test piece through which a 76 mm diameter sphere can pass freely;

b) when disintegrated, the sum of the weight of the 10 largest particles shall not weigh more than 0,1 kg.

5.3.5 Impact resistance

The impact test methods for the different parts of the product are described in CEN/TS 15680. The impact resistance of a stair and its components shall be assessed giving the type of impact test, angle of the impact and the impact point, the type and weight of the impact body and the drop height without damage.

5.4 Protection against noise

If required, general information for installation shall be given in view to reduce noise transmittance.

NOTE Care should be taken in the design and of the quality of the construction elements so that the effect of impact sound will be reduced. Using sound absorbent and/or materials with the connection of the stair components and between the stairs and the building could help to reduce impact sound.

5.5 Thermal performance

If required, general information for installation shall be given in view to improve thermal performance.

5.6 Aspect of durability, serviceability and identification

5.6.1 General

The components and materials of stairs shall be clearly identified.

NOTE It may be done by reference to a standard, by testing, on experience based on a traditional knowledge or historical data.

The identification shall cover mechanical properties, fire properties, release of dangerous substances and durability aspects.

The steps of stairs shall be made of materials and components with the load bearing capacity verified according to the relevant technical specifications (Eurocodes) including the standard values given therein. If this is not the case, then proof of the loadbearing capacity of the product shall be made by tests carried out on structural members, or the characteristic values of the materials shall be determined by testing for static calculation of the stair. If tabulated solutions exist, the evidence of the conformity with their indication is sufficient.

5.6.2 Resistance to deterioration caused by climatic conditions

If necessary, general information to reduce the deterioration caused by climatic conditions, given in Table 4, shall be given in view to reduce the potential risk.

The effect of climatic conditions shall be described in qualitative terms with regard to the potential risk that the stairs loose their integrity and cease to fulfil the requirements. The intended use conditions shall be given.

Table 4 — Climatic conditions

	Internal (General conditions)	External (non general conditions)
Temperature (air)	+ 5 °C, + 40 °C	-30 °C, + 50°C
Relative humidity	30 % - 85 %	30 % – 95 %
NOTE Higher and lower humidity and temperature are possible for a short period, see 6.1.2 to 6.1.4.		

5.6.3 Resistance to deterioration caused by chemical agents

The resistance against chemical agents shall be assessed by general examination of the materials and the construction regarding the effects of cleaning agents, water, and naturally occurring corrosives and pollution agents in the air. When relevant, testing shall be used, e.g. for materials of unknown composition or performance, or if the manufacturer makes specific claims.

The effect of chemical agents shall be described in qualitative terms with regard to potential risk that the stairs will loose their integrity and cease to fulfil the requirements.

5.6.4 Resistance to deterioration caused by biological agents

The resistance against biological agents shall be assessed by general examination of the materials and the construction regarding the effects of fungi and insects. When relevant, testing shall be used, e.g. for materials of unknown composition or performance, or if the manufacturer makes specific claims.

The effect of biological agents shall be described in qualitative terms with regard to the potential risk that the stairs will loose their integrity and cease to fulfil the requirements.

5.6.5 Finishes

The assumed function of the finish shall be assessed by general inspection. When relevant, testing shall be used, e.g. for surface treatments and materials of unknown composition or performance, or if the manufacturer makes specific claims.

6 Application to prefabricated stairs made of solid wood

6.1 Intended use

6.1.1 General

Unless specified, the manufacturer shall identify for wood elements, the service location for which the stair is intended. Intended use situations as classified in Clause 4.1 are limited (taking into account EN 942).

6.1.2 Intended use: heated space

Conditions corresponding to service class 1 of EN 1995-1-1 which is characterised by a moisture content in the material corresponding to a temperature of 20 °C and a relative humidity of the surrounding air only exceeding 65 % for a few weeks per year.

NOTE Equilibrium moisture for the wood between 6 % and 10 % if average temperature is higher than 21 °C, equilibrium moisture between 9 % and 13 % if average temperature between 12 °C and 21 °C.

6.1.3 Intended use: unheated space (humid conditions)

Conditions corresponding to service class 2 of EN 1995-1-1 which is characterised by a moisture content in the material corresponding to a temperature of 20 °C and a relative humidity of the surrounding air only exceeding 85 % for a few weeks per year.

NOTE Equilibrium moisture for the wood between 12 % and 16 % if average temperature is less than 12 °C.

6.1.4 External conditions non exposed or exposed

Conditions corresponding to service class 3 of EN 1995-1-1 which is characterised by climatic conditions leading to higher moisture contents than in service class 2.

NOTE Equilibrium moisture for the wood is generally higher than the one given for the service class 2.

6.2 Materials

Four main conditions may affect the use for wood elements: climatic conditions (see above), traffic frequency (see Clause 4), comfort (see Clause 4) and loading time.

7 Solid wood prefabricated stair characteristics

7.1 General

The characteristics for stairs made of solid wood shall be determined and expressed in accordance with the following (on the basis of Clause 5).

For geometry, see Clause 4.3.1 for dimensions to be declared. The declaration gives also tolerances and Clause 5 applies.

7.2 Solid wood products

For solid wood products, elements shall meet the requirements in prCEN/TS (WI 00175121) [3)].

That means:

— define species used (see Clause 8.2);

— precise the classification by appearance offered;

— moisture content;

— necessary dimensions concerning wooden elements;

— biological treatment, if any;

— fire retardant protection, if any,

— information concerning laminated elements and finger jointed elements with gluing characteristics;

— surface treatment: information shall be given concerning the relevant surface treatment. The product can be delivered with a factory applied surface coating which allows the product to be taken into use immediately after installation. The surface treatment used and any artificial change of the natural wood colour shall be stated in the product description.

7.3 Other materials

Other materials used with solid wood can be considered. If standards for other materials exist, references to them shall be given. Reaction of timber with other materials must be considered (example: steel screws and nails in oak).

7.4 Safety in case of fire

NOTE See Clause 4.2.3.

3) Under preparation by CEN/TC 175/WG3/TG7

7.4.1 Resistance to fire

In addition to Clause 5.2.1, calculation methods can also be used (see EN 1995-1-1). This shall clearly be stated specifying the boxed values used.

7.4.2 Reaction to fire

See Clause 5.2.2 and Annex D.

Products meeting the definitions given in Tables 5 and 6 (tables coming from CWFT procedure) are considered to be classified without further testing in the class(es) shown. Other products shall be tested and classified (as flooring) in accordance with EN 13501-1 with, in addition to any specific provisions on mounting and fixing given in the test standards, the products being mounted and fixed in a manner representative of their intended end use.

For the upper side of steps and landings (analogous to flooring), the classification for flooring elements shall be considered, see Commission Decision 2000/147/EC.

All other parts shall be considered and handled as specified in the classification for walls and ceilings, see Commission Decision 2000/147/EC.

Table 5 — Classes of reaction to fire performance for wood stair steps (extract from Commission Decision 2000/147/EC, Table 2)

Product [1,7)]	**Product detail** [4)]	**Minimum mean density** [5)] kg/m^3	**Minimum overall thickness** mm	**End use condition**	**Class** [3)] **for floorings**
Wood flooring and parquet	Solid flooring of oak or beech with surface coating	Beech: 680 Oak: 650	8	Glued to substrate [6)]	C_{fl}-s1
-"-	Solid flooring of oak, beech or spruce and with surface coating	Beech: 680 Oak: 650 Spruce: 450	20	With or without air gap underneath	C_{fl}-s1
-"-	Solid wood flooring with surface coating and not specified above	390	8	Without air gap underneath	D_{fl}-s1
-"-	-"-	390	20	With or without air gap underneath	D_{fl}-s1

1) Mounted in accordance with EN ISO 9239-1, on a substrate of at least Class D-s2,d0 and with minimum density of 400 kg/m^3 or with an air gap underneath.

2) An interlayer of at least Class E and with maximum thickness 3 mm may be included in applications without an air gap, for parquet products with 14 mm thickness or more and for veneered floor coverings.

3) Class as provided for in Commission Decision 2000/147/EC, Table 2.

4) Type and quantity of surface coatings included are acrylic, polyurethane or soap, 50 g/m^2 - 100 g/m^2, and oil, 20 g/m^2 - 60 g/m^2.

5) Conditioned according to EN 13238 (50 % RH 23 °C).

6) Substrate at least Class A2-s1,d0.

7) Applies also to steps of stairs

Table 6 — Classes of reaction to fire performance for vertical elements (Extract from Commission Decision 2000/147/EC, Table 1)

Product [11]	**Product detail** [5]	**Minimum mean density** [6] kg/m^3	**Minimum thicknesses, total / minimum** [7] mm	**End-use condition** [4]	**Class** [3]
Panelling and cladding [1]	Wood pieces with or without tongue and groove and with or without profiled surface	390	9 / 6	Without air gap or with closed air gap behind	D-s2, d2
-"-	-"-	390	12 / 8	-"-	D-s2, d0
Panelling and cladding [2]	-"-	390	9 / 6	With open air gap ≤ 20 mm behind	D-s2, d0
-"-	-"-	390	18 / 12	Without air gap or with open air gap behind	D-s2, d0
Wood ribbon elements [8]	Wood pieces mounted on a support frame [9]	390	18	Surrounded by open air on all sides [10]	D-s2, d0

1) Mounted mechanically on a wood batten support frame, with the gap closed or filled with a substrate of at least class A2-s1,d0 with minimum density of 10 kg/m^3 or filled with a substrate of cellulose insulation material of at least class E and with or without a vapour barrier behind. The wood product shall be designed to be mounted without open joints.

2) Mounted mechanically on a wood batten support frame, with or without an open air gap behind. The wood product shall be designed to be mounted without open joints.

3) Class as provided for in Commission Decision 2000/147/EC, Table 1. This decision is currently under review in respect to façade applications.

4) An open air gap may include possibility for ventilation behind the product, while a closed air gap will exclude such ventilation. The substrate behind the air gap must be of at least class A2-s1,d0 with a minimum density of 10 kg/m^3. Behind a closed air gap of maximum 20 mm and with vertical wood pieces, the substrate may be of at least class D-s2,d0.

5) Joints include all types of joints, e.g. butt joints and tongue and groove joints.

6) Conditioned according to EN 13238.

7) As illustrated in Figure 1 below. Profiled area of the exposed side of the panel not more than 20 % of the plane area, or 25 % if measured at both exposed and unexposed side of the panel. For butt joints, the larger thickness applies at the joint interface.

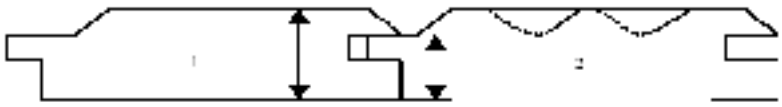
8) Rectangular wood pieces, with or without rounded corners, mounted horizontally or vertically on a support frame and surrounded by air on all sides, mainly used close to other building elements, both in interior and exterior applications.

9) Maximum exposed area (all sides of rectangular wood pieces and wood support frame) not more than 110 % of the total plane area, see Figure 2 below.

10) Other building elements closer than 100 mm from the wood ribbon element (excluding its support frame) must be of at least class A2-s1,d0, at distances 100 mm - 300 mm of at least class B-s1,d0 and at distances more than 300 mm of at least class D-s2,d0.

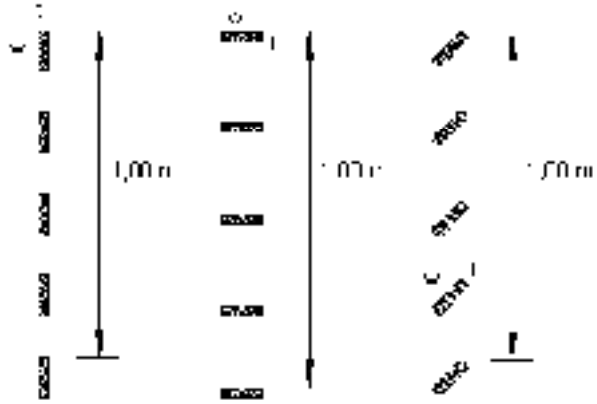
11) Applies also to stairs.

Table 1 (*concluded*)



Key
1 total thickness
2 minimum thickness at any point of the profile

Figure 1 — Profiles for solid wood panelling and cladding



Maximum exposed area of wood ribbon element: $2n\,(t \times w) + a \leq 1{,}10$

where

n is the number of wood pieces per metre;

t is the thickness of each wood piece, in metres;

w is the width of each wood piece, in metres;

a is the exposed area of wood support frame (if any), in m^2, per m^2 of wood ribbon element.

Figure 2 — Maximum exposed area

7.5 Dangerous substances

7.5.1 Formaldehyde release (expressed in term of classes)

Where the materials used by the manufacturer do not release formaldehyde, the manufacturer shall continue to check, with a frequency defined in his FPC manual, that no other material is used. For formaldehyde release materials, the manufacturer shall use the provisions of Table C.1 of Annex C with a frequency sufficient to ensure that the class E1 is obtained.

NOTE For building products under the CPD, CE Marking gives information on formaldehyde release.

Solid wood as such, without chemical treatment, without adhesive, without coating or finishing, has no formaldehyde release of significance.

7.5.2 Content of pentachlorophenol (expressed in term of values)

Where the materials used by the manufacturer do not contain pentachlorophenol, the manufacturer shall continue to check, with a frequency defined in his FPC manual, that no other material is used. For pentachlorophenol containing materials, the manufacturer shall use the provisions of 4.3 with a frequency sufficient to ensure that the class is obtained. A manufacturer declaring “PCP > 5 ppm” need perform no FPC testing, unless he wishes to change this declaration.

NOTE A Technical Report has been published: CEN/TR 14823 – Durability of wood and wood based products – Quantitative determination of Pentachlorophenol in wood – Gas chromatographic method.

7.6 Safety in use

7.6.1 Impact resistance

See Clause 5.3.5.

7.6.2 Slipperiness

The slipperiness of steps, landings and walkways is dependent on the timber surface treatment or design used. Where steps, walkways and landings are supplied with an applied coating or surface finish, this slipperiness of the finish shall be evaluated.

If a slipperiness value is declared, the manufacturer shall ensure that the wood used in the wear layer, and the surface finish or finishing (e.g. the addition of varnish or polish) remain the same as that submitted for initial type testing. Tests shall be made according to indications given in Clause 5.3.2. No FPC testing is necessary as long as the wood used in the wear layer, the surface finish or the surface finishing does not change. If they do change, the manufacturer shall repeat the initial type test.

7.6.3 Load bearing capacity of stairs

See 4.2.2.1.

7.6.4 Stability and stiffness

See 4.2.2.3.

7.6.5 Resistance to fixing

See 4.2.2.4.

7.7 Acoustic performance

See Clause 5.4.

7.8 Biological durability

7.8.1 General

The durability (see Annex B) of stairs depends on the performance of the individual components as well as their assemblies.

If necessary, the manufacturer shall provide information about maintenance.

7.8.2 Natural durability

If the species is listed in EN 350-2, the natural durability shall be as given therein; otherwise it shall be assessed in accordance with EN 350-1.

7.8.3 Wood treated against biological attack

7.8.3.1 General

Wood treated against biological attack shall meet national requirements.

Preservative treated products shall be defined by:

— use class in accordance with EN 335-2;

— wood preservative in accordance with EN 599-2;

— penetration class in accordance with EN 351-1;

— retention of preservative in accordance with EN 351-1.

Any machining, boring, planning, etc. shall be completed before preservative treatment. In case of wane, the bark shall be removed.

7.8.3.2 Preservatives

Wood preservatives used shall conform to the performance requirements given in EN 599-2 appropriate for the use class.

7.8.3.3 Penetration

The minimum penetration shall be declared in terms of the penetration classes listed in EN 351-1.

7.8.3.4 Retention

The average retention in the analytical zone (see EN 351-1) shall be equal to or greater than the retention requirement for the preservative used in the declared use class.

7.8.4 Biological durability level (expressed in term of use classes)

For biological durability, the manufacturer shall ensure that the timber species used in the finished stairs remain the same or do not change to an extent which would change the declared durability class. For conferred durability classes, the producer shall apply the principle defined in 7.8.2 and 7.8.3, knowing that less durable species will provide only limited service life in fully exposed exterior situation unless appropriate preservative treatment or design are employed. No FPC testing is necessary as long as the wood used does not change and the preservative characteristics and the application method are maintained. For preservative use, the stair manufacturer shall follow indications of internal control expressed by the preservative manufacturer. If the product, the characteristics of the product or the method of application of the preservative are different, the manufacturer shall repeat the initial type test using 3 samples.

7.9 Surface resistance

7.9.1 Finishes and wear resistance

The wear resistance shall be measured following EN 13696.

7.9.2 Hardness

Hardness shall be measured according to EN 1534.

NOTE 1 Any species of wood used for steps should have a minimum mean value for Brinell hardness (HB) of 10 N/mm^2.

NOTE 2 A list is given in Annex # of prCEN/TS (WI 00175122) [4)].

7.9.3 Resistance to chemical agents

For resistance to chemical agents, the manufacturer shall ensure that the stairs and the parts of them, especially joints, shall not be adversely affected by the chemical agents using standard EN 13442.

7.10 Safety equipment

See Clause 5.3.3.

7.11 Safe breakage

See Clause 5.3.4.

7.12 Impact resistance

See Clause 5.3.5.

7.13 Behaviour of stair in various/changing indoor and outdoor climates

This clause shall be carried out in accordance with EN 1294 and EN 1121. The results of test climates c, d and e shall be expressed in accordance with EN 12219.

NOTE For elements to be used in the test procedure, see Clause 5.6.1

4) Draft under preparation by CEN/TC 175/WG3/TG7.

7.14 Dimensions

All dimensions shall be given at a reference moisture content of 9 %, 12% or 15% (corresponding to the foreseen use situation).

NOTE 1 If the conditions are different, for example weather exposed, information is given at the reference clearly announced.

Unless there is evidence to the contrary, it shall be assumed that the thickness and width of a piece of timber increase by 0,25 % for every 1 % of moisture content above the reference moisture content, and decrease by 0,25 % for every 1 % of moisture content below the reference moisture content.

The methods of measurement of dimensions are given in EN 13647.

NOTE 2 The equilibrium moisture content for the end use conditions may not be the same as the moisture content at which the dimensions are declared.

7.15 Classification and decorative appearance of elements

Species shall be specified for solid timber steps. For appearance rules and natural colours, refer to standard prCEN/TS (WI 175121) [5)].

NOTE Wood species exhibit natural colour and grain variations. Each species and consignment will have varied decorative appearance according to the procurement area.

7.16 Dimensioning of risers and treads and the slope of the stair

Information is given in Clause 5.1.2. In addition, prCEN/TS (WI175121) [4)] can be used.

7.17 Finishing

Information on characteristics of timber shall be given for finishes (e.g. characteristics on slipperiness of varnish).

8 Factory production control

8.1 General

The producer shall establish and maintain a production control system to ensure that the products placed on the market are conforming to the announced performance characteristics. The control system shall consist of procedures, regular inspections, and tests or assessments. The results shall be used to control raw and other incoming materials or components and equipment. The production process and the product shall be sufficiently detailed to ensure that the conformity of the product is apparent.

The FPC shall be suitable for the type and method of production, e.g. batch quantity, product type.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

The manufacturer shall appoint a person to be responsible for the FPC system in each manufacturing unit and shall provide sufficient and competent personal to establish, document and maintain an FPC system.

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5) Draft in preparation by CEN/TC 175/WG3/TG7.

If the manufacturer operates a factory production control system conforming for example to EN ISO 9001, and makes specific to the requirements of this standard, the above requirements are considered to be satisfied.

8.2 Equipment

Testing: weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented frequencies and criteria defined in the manufacturer's FPC procedures.

Manufacturing: equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

8.3 Raw material and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their conformity.

8.4 Production process

The FPC system shall document the various stages in the production, identify the checking procedure and those individuals responsible for all stages of production.

During the production process itself, a record shall be kept of all checks, their results, and any corrective actions taken. This record shall be sufficiently detailed and accurate to demonstrate that all stages of the production phase, and all checks, have been carried out satisfactorily.

8.5 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of all of the characteristics are maintained. The means of control are:

— test and/or inspection of non-finished products or parts hereof during the production process;

— test and/or inspection of finished products.

Test and/or inspection shall be performed and evaluated in accordance with a test plan (including frequencies and criteria) prepared by the manufacturer and in accordance with Clause 4 or any suitable part of relevant test standards.

8.6 Non-conforming products

The manufacturer shall have written procedures which specify how non-conforming products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

9 Labelling

The labelling shall include reference to the product standard mentioned in the scope of this standard, the relevant properties for the intended application (see Clause 6.1 and completed the product standard information on marking).

The accompanying information shall be placed on the product itself, on a label attached to it, on the packaging or on the accompanying commercial documents. The order in which the list is presented clearly reflects a hierarchy of preference.

The information contained shall be applicable at the time of handover.

The labelling shall include a reference to this standard (EN 15644) and the information according to (a), (b), (c) and (d), if needed, below.

Except if otherwise specified in a contract or if no regulation is existing in the end use country, “npd” can be used in front of the relevant characteristic.

a) Requirements based on classes:

- reaction to fire: A, B, C, D, E and value of smoke production s1 or s2 where the class requires this;
- resistance to fire (load bearing capacity R);
- slipperiness;
- wear resistance and hardness;
- formaldehyde class E_1;
- content of pentachlorophenol (no indication if pentachlorophenol $\leq 5 \times 10^{-6}$ and $> 5 \times 10^{-6}$ in all other cases);
- biological durability.

b) Requirements based on declared values:

- performance characteristics;
- load bearing capacity;
- stability and stiffness;
- resistance to fixing;
- safety equipment;
- safe breakage;
- impact resistance.

c) Information on the mode of installation.

d) Information on finishing provided (finishes and surface layers).

Further more, the manufacturer shall provide sufficient information to ensure the traceability of his product, e.g. by means of product codes giving the link between the product, the manufacturer and the production. This information may be labelled on the product or in accompanying papers.

10 Handling, installation, maintenance and care

The manufacturer shall provide information on the following:

— storage and handling, if the manufacturer is not responsible for installation of the product;

— installation requirements and techniques (on site), if the manufacturer is not responsible for installation of the product;

— maintenance and cleaning;

— end use instructions including instructions on component replacement;

— safety in use instructions.

Annex A
(informative)

Dimensional and performance characteristics of balustrades, handrails and flights of stairs in connection with the classification given in 4.1

Dimensional and performance characteristics are usually covered by National regulations or national standardised specifications, and are the reference. Classes and values which are given here are only in connection with classification given in 4.1.

A.1 Handrails and/or balustrades

A.1.1 Minimum lowest height of handrails and/or balustrades corresponding to the classification given in 4.1

NOTE 1 The height of balustrades and/or handrails varies according to national regulations. These regulations use different conditions of use and location to identify the height required. It is therefore not possible in this standard to indicate a minimum height for all situations. For this reason, only a minimum height for balustrades to landings is given. A minimum height of a balustrade is 90 cm is recommended.

Table A.1 — Minimum lowest height of handrails and/or balustrades

	F3 (high traffic)	F2 (moderate traffic)	F1 (low traffic)
Lowest height of balustrades or handrails to landings	100 cm	100 cm	90 cm
Height of handrail to stair	90 cm	90 cm	90 cm

NOTE 2 These dimensions are the minimum expected in Europe, some countries have higher values. In special circumstances, for example, in multi-storey buildings or buildings of high occupancy, these heights may have to be raised. See Clause 4.5.3.1.

For additional handrails for stairs for children, the minimum height in Europe is 60 cm.

A.1.2 Grip of handrail

They also comply with following indications concerning free side distance between the handrail and any other element at this side (see Table A.2).

Table A.2 — Minimum free side distance

	F3	F2	F1
Minimum free side distance (length “a” of Figure 3)	4 cm	4 cm	3 cm

NOTE These dimensions are the minimum expected in Europe, some countries can have higher values

The length “b” of Figure 2 in Clause 4.3.3.2 is between 30 mm and 60 mm.

A.2 Mechanical performance characteristics

The loadings to be applied to stairs and stair components vary according to occupancy type. Occupancy types vary in national regulations. Therefore, for the purposes of this standard, the following use types are used:

- F_1 (low traffic): typical use: domestic: 1 – 10 persons in the building;

- F_2 (moderate traffic): typical use: domestic and/or commercial: 10 - 20 persons;

- F_3 (high traffic): typical use: public and industrial: more than 20 persons.

A.3 Sequence of tests

The sequence of tests, when applied to a complete stair, has to be mentioned in the test report (see CEN/TS 15680).

Annex B
(informative)

General considerations regarding biological durability

B.1 General precautions (extract from EN 335-2:2006, Annex 3)

If the use class for a component when in use cannot be determined accurately, or when different parts of the same component are deemed to be in different classes, decisions should be taken with regard to the more severe of the possible use classes.

Where a wood component is inaccessible or where the consequences of its failure would be particularly serious, it may be more appropriate to consider a more durable timber or a more intensive preservative treatment than is usual for the perceived use class. The different durability and treatability of sapwood and heartwood should always be considered.

B.2 Natural or conferred durability of sound wood (extract from EN 335-2:2006, Annex 4)

The natural durability of solid wood can depend to a large extent upon:

— species, see EN 460,

— the presence of heartwood or sapwood.

Improved durability may be conferred on solid wood by preservative treatment. The methods of treatment that may be used depend upon:

— species,

— the presence of heartwood or sapwood,

— the preservative product used and the penetration and retention values selected from EN 351-1.

For the natural durability of wood, see EN 350-2.

For treated wood, the penetration and retention combinations available, see EN 351-1.

For the performance of wood preservatives, see EN 599-1.

Annex C
(normative)

Formaldehyde classes

C.1 Product to be tested

When a product has to be tested, the test to be applied is EN 717-1, except for referring to EN 326-1 for test pieces so that the test is done only on the face exposed.

Representative part of stair (same adhesive type, same finishing and same panel) shall be tested.

C.2 Materials to be tested

Where formaldehyde-containing materials, particularly aminoplastic resins, have been added to the product as a part of the production process, the product shall be tested or assessed and classified into E1.

The test requirements for both initial type testing and factory production control/continuous surveillance are laid down in Table C.1 for Class E1 products.

NOTE 1 Boards of Class E1 can be used without causing an indoor air concentration greater than 0,1 ppm HCHO in conditions according to EN 717-1.

The test requirement does not apply to wood flooring to which no formaldehyde containing materials were added during production or in post-production processing. Such products may be classified E1 without testing.

The limit values for the formaldehyde Class E1 are given in Table C.1.

NOTE 2 Experience has shown that, to ensure compliance with the limits in Table B.1, the rolling average of the EN 120 values (see EN 326-2) found from the internal factory control over a period of ½ year should not exceed 6,5 mg HCHO / 100 g panel mass for particleboards and OSB or 7 mg HCHO / 100 g panel mass for MDF.

Table C.1 — Formaldehyde Class E1 (extract from EN 13986:2004)

		Panel Product		
		Unfaced	Unfaced	Coated or overlaid
		Particleboards OSB MDF	Plywood Solid wood panels	Particleboards OSB MDF Plywood Solid wood panels Fibre boards (wet process)
Initial type testing	Test method	EN 717-1		
	Requirement	Release ≤ 0,12 mg/m^3 air		

For internal control, the indications given in EN 13986 shall be followed.

If a stair element is composed of panels of Class E1, and if no formaldehyde is added in the process of assembly, the classification E1 can be used without testing.

Natural element on which or in which no formaldehyde had been added during the production are automatically classified E1.

Annex D
(informative)

Remind of classes of reaction to fire performance for construction products for flooring including their surface coverings (OJEC 150/18 - 23.2.2000) (Extract from EN 13501-1:2007)

Class	Test method(s)	Classification criteria	Additional classification
$A1_{FL}$	EN ISO 1182(1) ; *and*	$\Delta T \leq 30°C$; *and* $\Delta m \leq 50$ %; *and* $t_f = 0$ (i.e. no sustained flaming).	
	EN ISO 1716	PCS ≤ 2,0 $MJ.kg^{-1}$ (1); *and* PCS ≤ 2,0 $MJ.kg^{-1}$ (2); *and* PCS ≤ 1,4 $MJ.m^{-2}$ (3); *and* PCS ≤ 2,0 $MJ.kg^{-1}$ (4).	
$A2_{FL}$	EN ISO 1182 (1) *or*	$\Delta T \leq 50°C$; *and* $\Delta m \leq 50$ %; *and* $t_f \leq 20$ s.	
	EN ISO 1716 ; *and*	PCS ≤ 3,0 $MJ.kg^{-1}$ (1); *and* PCS ≤ 4,0 $MJ.m^{-2}$ (2); *and* PCS ≤ 4,0 $MJ.m^{-2}$ (3); *and* PCS ≤ 3,0 $MJ.kg^{-1}$ (4).	
	EN ISO 9239 (5)	Critical flux (6) ≥ 8,0 $kW.m^{-2}$	Smoke production (7)
B_{FL}	EN ISO 9239-1(5) *and*	Critical flux (6) ≥ 8,0 $kW.m^{-2}$	Smoke production (7)
	EN ISO 11925-2 (8) *Exposure = 15 s*	Fs ≤ 150 mm within 20 s	
C_{FL}	EN ISO 9239-1 (5) and	Critical flux (6) ≥ 4,5 $kW.m^{-2}$	Smoke production (7)
	EN ISO 11925-2 (8) *Exposure = 15 s*	Fs ≤ 150 mm within 20 s	
D_{FL}	EN ISO 9239-1 (5) *and*	Critical flux (6) ≥ 3.0 $kW.m^{-2}$	Smoke production (7)
	EN ISO 11925-2 (8) *Exposure = 15 s*	Fs ≤ 150 mm within 20 s	
E_{FL}	EN ISO 11925-2 *Exposure = 15 s*	Fs ≤ 150 mm within 20 s	
F_{FL}	No performance determined		

(1) For homogeneous products and substantial components of non-homogeneous products.

(2) For any external non-substantial component of non-homogeneous products.

(3) For any internal non-substantial component of non-homogeneous products.

(4) For the product as a whole.

(5) Test duration 30 minutes.

(6) Critical flux is defined as the radiant flux at which the flame extinguishes or the radiant flux after a test period of 30 minutes, whichever is the lower (i.e. the flux corresponding with the furthest extend of spread of flame).

(7) S1 = Smoke ≤ 750 % min; S2 = not S1.

(8) Under conditions of surface flame attack and, if appropriate, to the end-use application of the product, edge flame attack.

Annex E
(informative)

Examples of traditional and non traditional timber stairs

E.1 Examples of traditional timber stairs

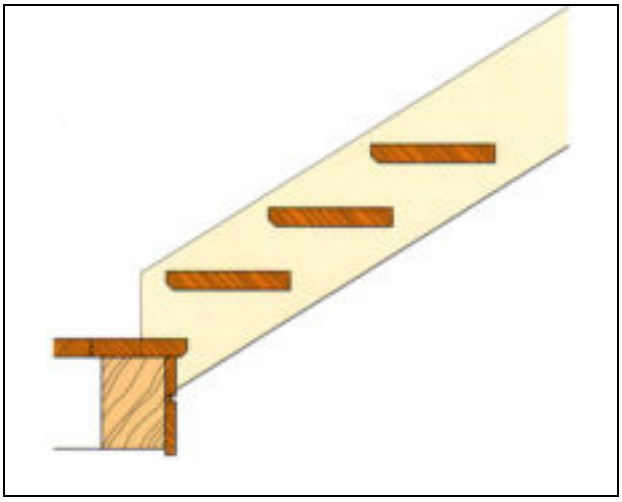

Figure E.1 — Stair with (half) close string

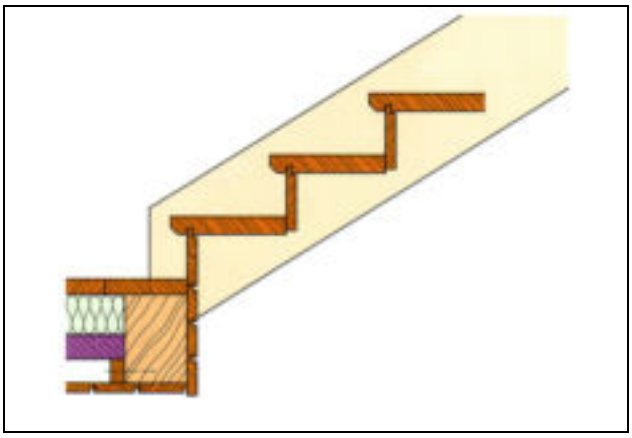

Figure E.2 — Stair with close string

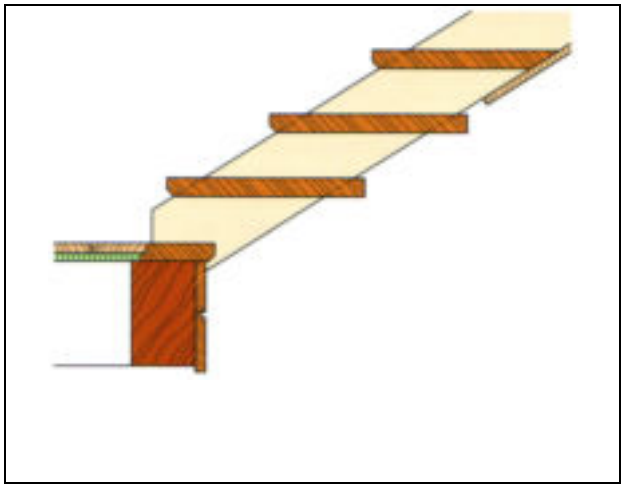

Figure E.3 — Stair with string equivalent to close string

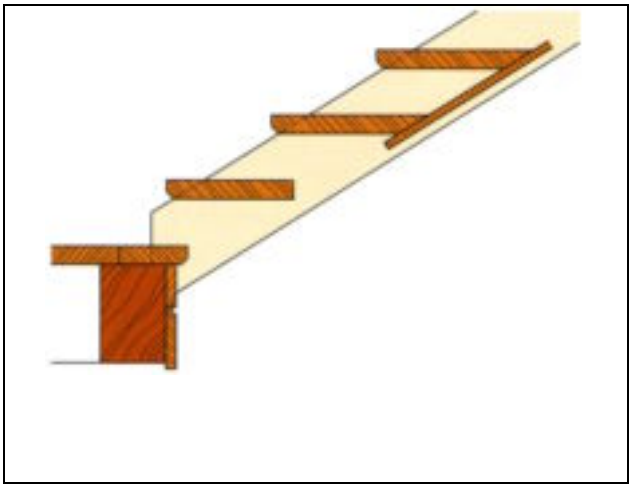

Figure E.4 — Stair with string equivalent to close

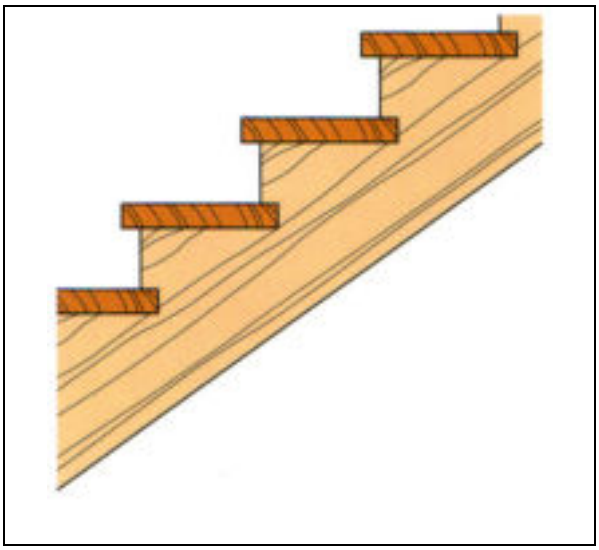

Figure E.5 — Stair with cut string

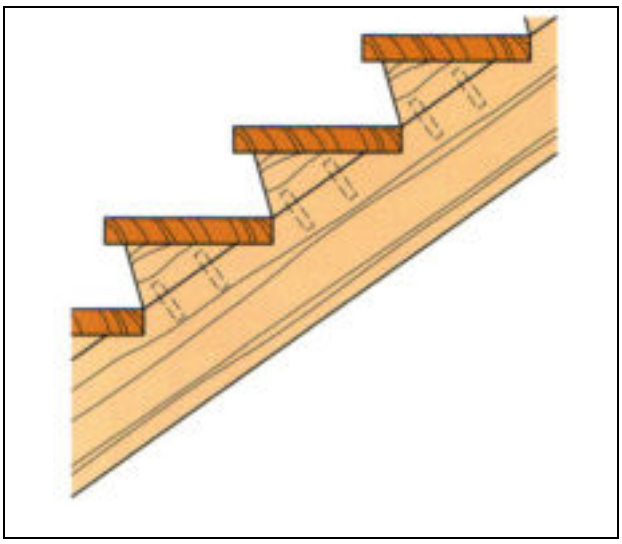

Figure E.6 — Stair with specific type of cut string

E.2 Examples of non traditional timber stairs

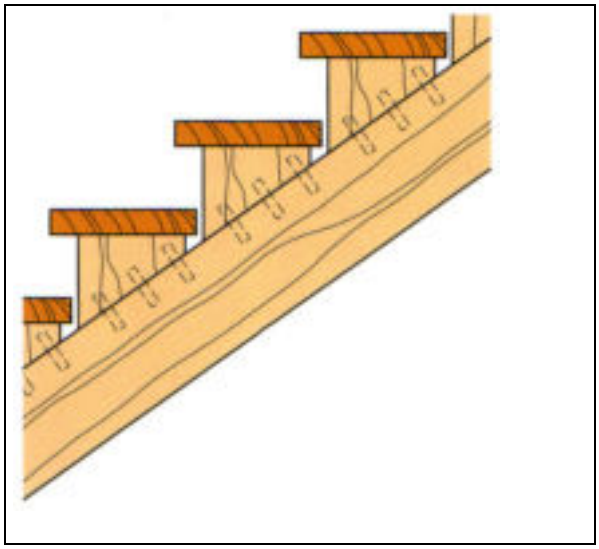

Figure E.7 — Type of coupling to string (example 1)

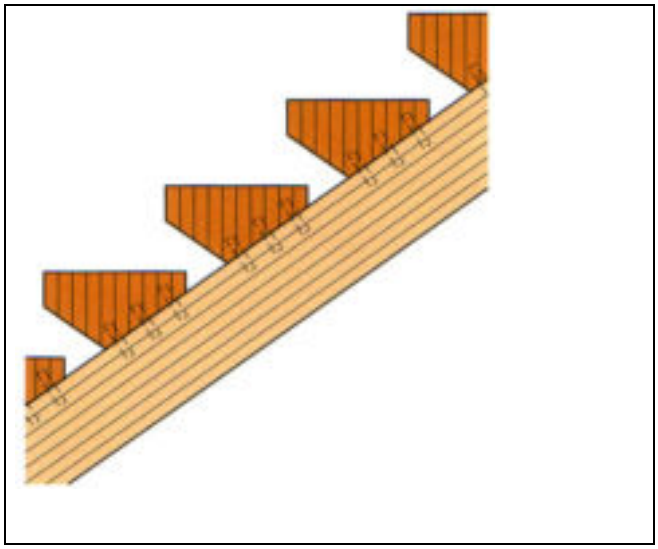

Figure E.8 — Type of coupling to string (example 2)

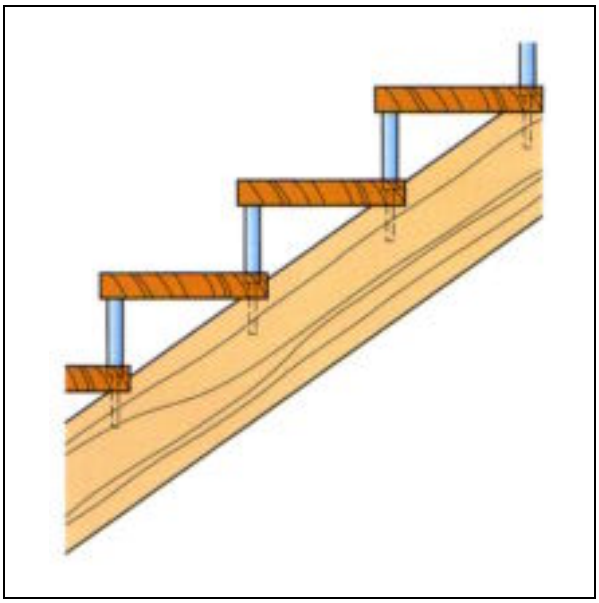

Figure E.9 — Type of coupling to string (example 3)

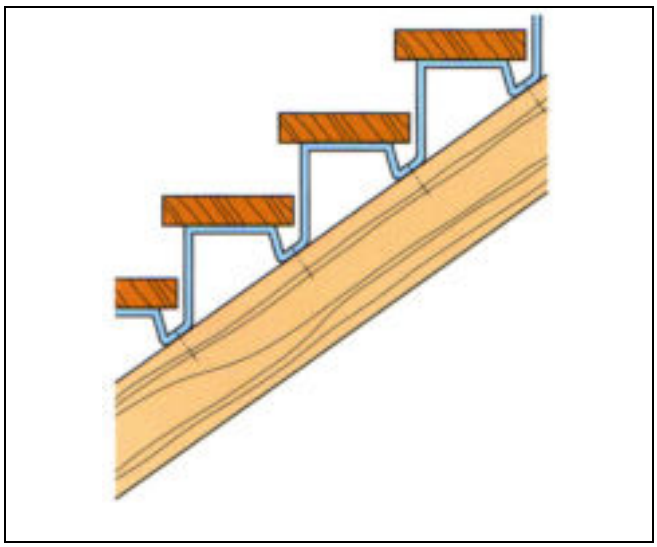

Figure E.10 — Type of coupling to string (example 4)

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