



BSI Standards Publication

Eurocode 5 — Design of timber structures

General rules and rules for buildings

National foreword

This British Standard is the UK implementation of EN 1995-1-1:2025. It supersedes [BS EN 1995-1-1:2004+A2:2014](#), which will be withdrawn on 30 March 2028.

The UK participation in its preparation was entrusted to Technical Committee B/525/5, Structural use of timber.

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

National choice is allowed in this standard where explicitly stated within notes. The National Annex to this standard contains the national choices to be used for buildings and civil engineering works constructed in the UK.

The first generation of EN Eurocodes was published between 2002 and 2007, with conflicting British Standards withdrawn in 2010. This document forms part of the second generation of EN Eurocodes.

The second generation of EN Eurocodes is expected to be published between 2023 and 2026. These documents are being published as soon as they are available. This is being done to enable users to prepare for the transition from the first generation to second generation of EN Eurocodes.

UK adoptions of the first generation of EN Eurocodes will be withdrawn by BSI on 30 March 2028. Until that date, the first generation documents should be considered as the applicable standards for buildings and civil engineering works constructed in the UK unless otherwise specified by the relevant authority or in the specification for a particular project.

This standard is intended to be used with its National Annex and other referenced documents, including other second generation Eurocodes, as an interdependent suite of documents.

While the use of provisions in this standard in conjunction with first generation Eurocodes is not precluded, it should be undertaken with care and should only be done when users are satisfied that it will not result in a lower level of reliability than the minimum level set in the first generation Eurocodes and associated UK National Annexes.

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Règles générales et règles pour les bâtiments

Eurocode 5 - Bemessung und Konstruktion von
Holzbauten - Teil 1-1: Allgemeine Regeln und Regeln
für den Hochbau

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 1995-1-1:2025) has been prepared by Technical Committee CEN/TC 250 “Structural Eurocodes”, the secretariat of which is held by BSI. CEN/TC 250 is responsible for all Structural Eurocodes and has been assigned responsibility for structural and geotechnical design matters by CEN.

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 December 2027, and conflicting national standards shall be withdrawn at the latest by April 2028.

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

This document supersedes EN 1995-1-1:2004.

The first generation of EN Eurocodes was published between 2002 and 2007. This document forms part of the second generation of the Eurocodes, which have been prepared under Mandate M/515 issued to CEN by the European Commission and the European Free Trade Association.

The Eurocodes have been drafted to be used in conjunction with relevant execution, material, product and test standards, and to identify requirements for execution, materials, products and testing that are relied upon by the Eurocodes.

The Eurocodes recognize the responsibility of each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level through the use of National Annexes.

The main changes compared to the previous edition are listed below:

- inclusions of main timber products, e.g. cross laminated timber (CLT);
- inclusion of product groups with similar material behaviour;
- inclusion of material parameters needed for the design according to this document;
- improved guidance on durability;
- inclusion of provisions on holes in beams;
- extension of compression perpendicular to grain verifications to serviceability limit state design;
- inclusion of provisions on reinforcements;
- improved guidance on vibration verification;
- inclusion on guidance on fatigue verification;
- inclusion of provisions on carpentry connections;
- inclusion of provisions on bonded-in rods;
- inclusion of provisions on foundations with timber piles;
- improved provisions on robustness.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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

0 Introduction

0.1 Introduction to the Eurocodes

The Structural Eurocodes comprise the following standards generally consisting of a number of Parts:

- EN 1990 Eurocode — Basis of structural and geotechnical design
- EN 1991 Eurocode 1 — Actions on structures
- EN 1992 Eurocode 2 — Design of concrete structures
- EN 1993 Eurocode 3 — Design of steel structures
- EN 1994 Eurocode 4 — Design of composite steel and concrete structures
- EN 1995 Eurocode 5 — Design of timber structures
- EN 1996 Eurocode 6 — Design of masonry structures
- EN 1997 Eurocode 7 — Geotechnical design
- EN 1998 Eurocode 8 — Design of structures for earthquake resistance
- EN 1999 Eurocode 9 — Design of aluminium structures

The Eurocodes are intended for use by designers, clients, manufacturers, constructors, relevant authorities (in exercising their duties in accordance with national or international regulations), educators, software developers, and committees drafting standards for related product, testing and execution standards.

NOTE Some aspects of design are specified by relevant authorities or, where not specified, can be agreed on a project-specific basis between relevant parties such as designers and clients. The Eurocodes identify such aspects making explicit reference to relevant authorities and relevant parties.

0.2 Introduction to EN 1995 (all parts)

EN 1995 (all parts) applies to the design of timber structures and gives specific design rules for buildings and civil engineering timber works.

EN 1995 is subdivided in various parts:

EN 1995-1 in itself does not exist as a single document but comprises the following three separate documents, the basic part being EN 1995-1-1:

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

EN 1995-1-2, *Eurocode 5 — Design of timber structures — Part 1-2: Structural fire design*

CEN/TS 19103, *Eurocode 5 — Design of timber structures — Structural design of timber-concrete composite structures – Common rules and rules for buildings* (foreseen to be published as EN 1995-1-3)

EN 1995-2, *Eurocode 5 — Design of timber structures — Part 2: Bridges*

EN 1995-3, *Eurocode 5 — Design of timber structures — Part 3: Execution*

EN 1995-2 “Bridges” refers to the common rules in EN 1995-1-1. The Clauses in EN 1995-2 supplement, modify or supersede them, where relevant.

EN 1995-3 “Execution” refers to the common rules in EN 1995-1-1. The Clauses in EN 1995-3 supplement the Clauses in EN 1995-1 and 1995-2.

0.3 Introduction to EN 1995-1-1

EN 1995-1-1 gives general design rules for timber structures and civil engineering timber works.

EN 1995-1-1 uses terms “should be considered” or “shall be considered”. In these cases, the user should or shall, respectively, consider whether a requirement is relevant for its design or not.

0.4 Verbal forms used in the Eurocodes

The verb “shall” expresses a requirement strictly to be followed and from which no deviation is permitted in order to comply with the Eurocodes.

The verb “should” expresses a highly recommended choice or course of action. Subject to national regulation and/or any relevant contractual provisions, alternative approaches could be used/adopted where technically justified.

The verb “may” expresses a course of action permissible within the limits of the Eurocodes.

The verb “can” expresses possibility and capability; it is used for statements of fact and clarification of concepts.

0.5 National Annex for EN 1995-1-1

National choice is allowed in this document where explicitly stated within notes. National choice includes the selection of values for Nationally Determined Parameters (NDPs).

The national standard implementing EN 1995-1-1 can have a National Annex containing all national choices to be used for the design of buildings and civil engineering works to be constructed in the relevant country.

When no national choice is given, the default choice given in this document is to be used.

When no national choice is made and no default is given in this document, the choice can be specified by a relevant authority or, where not specified, agreed for a specific project by appropriate parties.

National choice is allowed in EN 1995-1-1 through notes to the following clauses:

4.3.1.3(1)	4.3.1.4(1)	4.5.1(1)	4.5.1(2)
4.5.2(1)	4.5.2(2)	6.2.2.1(1)	6.2.2.2(1)
8.1.6.1(2)	9.3.2.2(6)	10.1(2)	C.4.2(1)
C.4.2(2)	F.3.2(1)	F.3.2(2)	F.3.9(3)
M.6.1(1)	M.6.2(1)	M.7(1)	

National choice is allowed in EN 1995-1-1 on the application of the following informative annexes:

Annex A	Annex B	Annex D	Annex E
Annex G	Annex H	Annex I	Annex N

The National Annex can contain, directly or by reference, non-contradictory complementary information for ease of implementation, provided it does not alter any provisions of the Eurocodes.

1 Scope

1.1 Scope of EN 1995-1-1

- (1) EN 1995-1-1 gives general design rules for timber structures.
- (2) EN 1995-1-1 also gives specific design rules for buildings and timber civil engineering works.

1.2 Assumptions

- (1) The assumptions of EN 1990 apply to this document.
- (2) It is assumed that the requirements for execution given in EN 1995-3 are complied with.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE See the Bibliography for a list of other documents cited that are not normative references, including those referenced as recommendations (i.e. through 'should' clauses) and permissions (i.e. through 'may' clauses).

EN 1990:2023¹, *Eurocode — Basis of structural and geotechnical design*

EN 1991 (all parts), *Eurocode 1 — Actions on structures*

EN 1992-1-1, *Eurocode 2 — Design of concrete structures — Part 1-1: General rules and rules for buildings, bridges and civil engineering structures*

EN 1993-1-9, *Eurocode 3 — Design of steel structures — Part 1-9: Fatigue*

EN 1995-3, *Eurocode 5 — Design of timber structures — Part 3: Execution*

EN 1997-3, *Eurocode 7 — Geotechnical design — Part 3: Geotechnical structures*

EN 1998 (all parts), *Eurocode 8 — Design of structures for earthquake resistance*

EN 1999-1-1, *Eurocode 9 — Design of aluminium structures — Part 1-1: General rules*

EN 10244, *Steel wire and wire products - Non-ferrous metallic coatings on steel wire - Part 1: General principles*

EN 14080:2013, *Timber structures - Glued laminated timber and glued solid timber - Requirements*

¹ As impacted by EN 1990:2023/prA1:2024

3 Terms, definitions and symbols

3.1 Terms and definitions

3.1.1 General

For the purposes of this document, the terms and definitions given in EN 1990 and the following apply.

3.1.1.1

assembly

composition of elements

3.1.1.4

member

physically distinguishable element of a load-bearing structure

3.1.1.3

thickness

cross-sectional dimension perpendicular to the *wide face* (3.1.1.4)

3.1.1.4

wide face

surface of a panel parallel to the veneer or layer planes

Note 1 to entry: For GLVL the wide faces may be geometrically smaller than the narrow face.

3.1.1.5

width

cross-sectional dimension in plane of the *wide faces* (3.1.1.4) perpendicular to grain direction

3.1.2 Basis of design

3.1.2.1

creep

increase of deformation due to duration of loading, the magnitude of which depends on the stress level, *moisture content* (3.1.2.5) and moisture content variations

3.1.2.2

equilibrium moisture content

moisture content (3.1.2.5) at which wood neither gains nor loses moisture

3.1.2.3

fibre saturation point

moisture content (3.1.2.5) at which the wood cell walls are completely saturated

3.1.2.4

grain direction

direction parallel to the wood fibres or for layered products the direction parallel to the wood fibres of the outermost *layer* (3.1.3.10) or the outermost veneer

3.1.2.5

moisture content

percentage of mass of moisture in wood compared to its dry mass

[SOURCE: EN 844:2019, 2.4.1]

3.1.2.6
stiffness property

property used in the calculation of the deformation of the structure

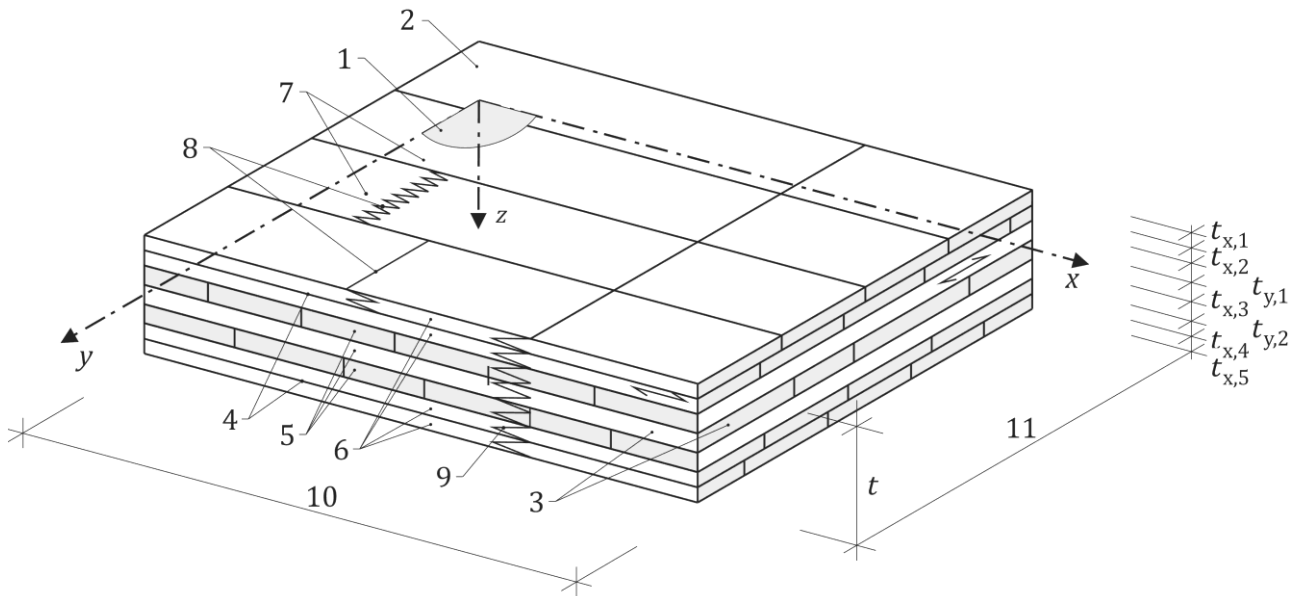
EXAMPLE Modulus of elasticity, shear modulus, slip modulus.

3.1.3 Materials

3.1.3.1
cross laminated timber
CLT

structural timber member composed of at least three face-bonded *layers* (3.1.3.10), at least one of which is oriented orthogonally to the two adjacent *layers* (3.1.3.10), which comprise timber laminations and which may comprise *wood-based panels* (3.1.3.17) as the outermost structural *layers* (3.1.3.10)

Note 1 to entry: See Figure 3.1



Key

1	plane of the element	8	finger joint in a lamination
2	wide face	9	large finger joint
3	edge face	10	usually the length
4	outer layer	11	usually the width <i>b</i> of a plate or height <i>h</i> of a beam
5	inner layer	<i>t</i>	overall thickness of the cross laminated timber
6	parallel outer laminations	<i>t_{x,i}</i>	thickness of layer <i>i</i> with fibres parallel to <i>x</i> -direction
7	lamination	<i>t_{y,i}</i>	thickness of layer <i>i</i> with fibres parallel to <i>y</i> -direction

Figure 3.1 — Cross laminated timber (CLT)

3.1.3.2
European technical product specification

European Standard (EN), European Technical Specification (TS) or a transparent and reproducible assessment that complies with all the requirements of an EAD.

Note 1 to entry: Some European technical product specifications might contain design information or reference to 1st generation of Eurocode 5 that is not applicable with this document.

3.1.3.3**glued laminated veneer lumber****GLVL**

timber product composed of *LVL* (3.1.3.12) being face-bonded parallel to the fibres of the outermost veneers

3.1.3.4**glued laminated timber****GL**

glued timber product composed of at least two essentially parallel to grain laminations which may comprise one or two boards side by side having finished thicknesses from 6 mm up to 45 mm (inclusive)

3.1.3.5**GLVL-C**

GLVL (3.1.3.3) where at least one panel or lamination consists of *LVL-C* (3.1.3.13)

3.1.3.6**GLVL-P**

GLVL (3.1.3.3) composed of *LVL-P* (3.1.3.14) bonded parallel to grain of the outermost veneers

3.1.3.7**laminated timber deck**

planar element made of parallel mechanically fixed, post-tensioned or bonded timber elements comprising only parallel oriented fibres

3.1.3.8**lamellae**

part of a structural glued timber product composed of one board or two or more finger-jointed boards

3.1.3.9**large finger joint**

finger joint through the full cross-sectional area of layered timber elements

3.1.3.10**layer**

part of a laminated timber product composed of adjacent *lamellae* (3.1.3.8)

3.1.3.11**layup**

cross-sectional arrangement of lamellae (3.1.3.8), veneers or wood-based panels (3.1.3.17)

3.1.3.12**laminated veneer lumber****LVL**

composite of wood veneers with wood fibres essentially oriented in the same direction

Note 1 to entry: This definition does not exclude laminated veneer lumber with cross grained veneers. See also Figure 3.2

[SOURCE: EN 14374:2004, definition 3.1]

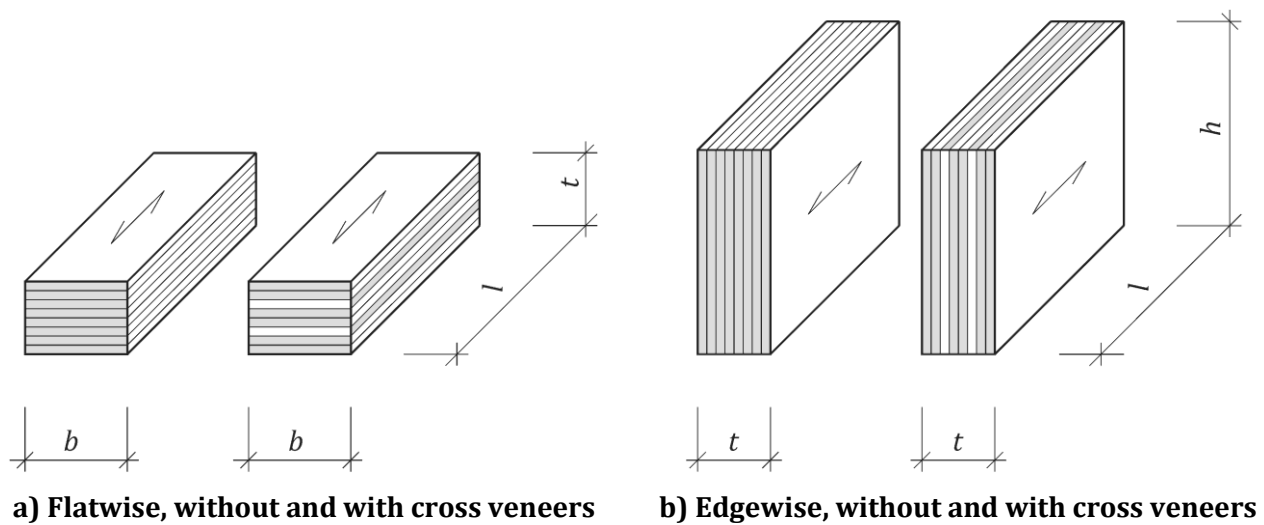


Figure 3.2 — Laminated veneer lumber (LVL)

3.1.3.13

LVL-C

laminated veneer lumber (3.1.3.12) of symmetric *layup* (3.1.3.11) with at least one crossband veneer

3.1.3.14

LVL-P

laminated veneer lumber (3.1.3.12) with the wood fibre direction of all veneers oriented in the same direction.

3.1.3.15

narrow face

surface of *cross laminated timber* (3.1.3.1), veneer based or solid wood panel perpendicular to the veneer or *layer* (3.1.3.10) planes

3.1.3.16

edge face

surface of *cross laminated timber* (3.1.3.1), veneer based or solid wood panel perpendicular to the veneer or *layer* (3.1.3.10) planes

Note 1 to entry: For GLV the wide faces can be geometrically smaller than the edge face

3.1.3.17

wood-based panel

timber product in accordance with EN 13986

3.1.3.18

softboard

wood fibre panel in accordance with EN 13986 with EN 622-4 or in accordance with a *European technical product specification* (3.1.3.2)

3.1.3.19**densified laminated wood****DLW**

laminated wood made from *layers* (3.1.3.10) of wood veneer bonded together under controlled conditions of heat and pressure using a thermosetting synthetic resin *adhesive* (3.1.9.11)

[SOURCE: EN 61061-1]

3.1.4 Durability**3.1.4.1****natural durability**

inherent resistance of wood species to attack by *wood-destroying fungi* (3.1.4.2) and *wood destroying insects* (3.1.4.3)

Note 1 to entry: Timber products can be made from species having different inherent resistances. Processing, particularly kiln-drying and layup, e.g. compositions from thin layers or veneers, can also affect the inherent resistance.

3.1.4.2**wood-destroying fungi**

fungi which can deteriorate the wood and thereby reduce the strength, stiffness and density of timber products

Note 1 to entry: Classifications of wood destroying fungi can be found in EN 335:2013, C.2.2.

Note 2 to entry: Blue stain and mould do not affect the mechanical properties but the surface appearance.

3.1.4.3**wood-destroying insects**

insects which can deteriorate the wood and thereby reduce the strength, stiffness and density of timber products

Note 1 to entry: Classification of wood destroying insects can be found in EN 335:2013, C3.

3.1.5 Structural analysis**3.1.5.1****bow imperfection**

distance of the centroid line from the perfect centroid line

3.1.5.2**sway imperfection of a member at a fork support**

rotation of the cross-section of a structural *member* (3.1.1.2) within its supports, from the perfect configuration expressed as z-axis inclination θ_{sup}

Note 1 to entry: Opposite sways can occur on consecutive supports.

3.1.5.3**sway imperfection of a member axis**

rigid body rotation of a *member* (3.1.1.2) from the perfect configuration expressed as x-axis inclination ϕ

3.1.5.4

twist imperfection

difference between the rotation of the cross section at midspan and the rotation of the cross section at the support

3.1.6 ULS

There are no terms related to this topic.

3.1.7 SLS

3.1.7.1

floating floor

floor layer, not connected to the load bearing structure

Note 1 to entry: Floating floors are usually set over an insulation layer.

3.1.7.2

joisted floor

floor in which the deck is supported by closely and mainly equally spaced parallel joists

3.1.7.3

rib-type floors

composite floor comprising a slab structurally connected with beams

EXAMPLE Timber-concrete composite floors, SWB or LVL ribbed floors.

3.1.7.4

slab type floors

floor acting as a plate structure

EXAMPLE Slabs made of CLT, LVL, nailed laminated or cross laminated timber-concrete composite

3.1.8 Fatigue

There are no terms related to this topic.

3.1.9 Connections

3.1.9.1

connection

area where two or more elements are fastened by mechanical means or *bond* (3.1.9.12)

3.1.9.2

connector

coupling device connecting components and/or *members* (3.1.1.2) using *dowel-type fasteners* (3.1.9.13)

3.1.9.3

metal plate connector

plane metal *connector* (3.1.9.2)

EXAMPLE Strap tie, nailing plate.

3.1.9.4**3D-connector**

folded or welded metal *connector* (3.1.9.2)

EXAMPLE Angle brackets, joist hangers, hold downs.

3.1.9.5**angle bracket**

L-shaped metal *3D-connector* (3.1.9.4), with or without stiffening corrugation used to fasten together *members* (3.1.1.2) using *nails* (3.1.9.15), screws or bolts

3.1.9.6**carpentry connection**

connection (3.1.9.1), which relies on direct contact between the connected members, possibly complemented with transversal fastener to prevent disconnection

EXAMPLE Shear connector, metal plate connector, 3D-connector.

3.1.9.7**single-step connection**

carpentry connection (3.1.9.6) where in-plane timber *members* (3.1.1.2) are connected at an angle to grain using a front or rear notch

3.1.9.8**double-step connection**

carpentry connection (3.1.9.6) where two in-plane timber *members* (3.1.1.2) are connected at an angle to grain using a front and a rear notch

3.1.9.9**dovetail connection**

carpentry connection (3.1.9.6) where the dovetail end (tenon) of secondary member fits into the counter profiled notch (mortice) of a primary member, and is self-locking

3.1.9.10**mortise and tenon connection**

positive locking joint of two timber *members* (3.1.1.2) where the cuboidal formed end of one *member* (3.1.1.2) fits into the cavity of another *member* (3.1.1.2)

3.1.9.11**adhesive**

non-metallic substance capable of joining materials by surface bonding (adhesion), and the *bond* (3.1.9.12) possessing adequate internal strength (cohesion)

[SOURCE: EN 923:2015, 2.1.1]

3.1.9.12**bond**

adhesion of one surface to another, with the use of an *adhesive* (3.1.9.11)

3.1.9.13**dowel-type fastener**

bar, with or without profiling, point, head or coating

EXAMPLE round metal dowel, octagonal wood dowel.

3.1.3.14

point length

length between last fully formed section or thread and the point side end of a *dowel-type fastener* (3.1.9.13)

3.1.9.15

nail

coated or uncoated *dowel-type fastener* (3.1.9.13) with uniform cross-section along its shank, usually pointed and headed

3.1.9.16

smooth shank nail

nail (3.1.9.15) with a constant cross-section along its entire shank length

3.1.9.17

profiled nail

nail (3.1.9.15) containing a profiled shank of minimum length of 4,5 times the shaft diameter

3.1.9.18

staple

coated or uncoated U-shaped round or flat wire *dowel-type fastener* made of steel

3.1.9.19

staple crown

part of a *staple* (3.1.9.18) that connects the legs

3.1.9.20

screw

metal *dowel-type fastener* (3.1.9.13) with one or two helical threads along the shank or portion thereof, usually pointed on one end, and with a head

3.1.9.21

coach screw

partially threaded *screw* (3.1.9.20) with a hex head where the shank diameter is equal or larger than the outer thread diameter

3.1.9.22

self-drilling screw

screw (3.1.9.22) with a rolled-on thread on the tip side, drill bit shaped tip, which drills the hole and forms the female thread itself

3.1.9.23

self-tapping screw

screw (3.1.9.20) with a rolled-on thread on the tip side, two threads or fully threaded and a tip, which forms the female thread itself

3.1.9.24

rod

threaded or ribbed bar, *dowel* or pipe

3.1.9.25

ribbed rod

reinforcing steel bar with at least two rows of ribs uniformly distributed over the entire length

3.1.9.26**bonded-in rod**

fastener used in *connection* (3.1.9.1) or as reinforcement of wood-based *member* (3.1.1.2) established by interaction of a *rod* (3.1.9.24), *adhesive* (3.1.9.11) and wood-based *member* (3.1.1.2)

3.1.9.27**rod with metric thread**

steel *rod* (3.1.9.24) with metric thread in accordance with ISO 68-1

3.1.9.28**rod with wood screw thread**

steel *rod* (3.1.9.24) with thread according to DIN 7998

3.1.9.29**expanded tube fastener**

steel tube used as *dowel-type fastener* (3.1.9.13) which is expanded in diameter

3.1.9.30**punched metal plate fastener****PMPF**

metal plate having integral projections punched out in one direction perpendicular to the base of the plate

3.1.9.31**field splice plate**

two-part connector plates with one part with integral projections as a *punched metal plate fastener* (3.1.9.30) and the second part to be connected and kept in place with *dowel-type fastener* (3.1.9.13)

3.1.9.32**shear connector**

connector (3.1.9.2) interposed between two elements to transfer shear force across the joint plane

EXAMPLE Ring connector, shear plate connector and toothed-plate connector.

3.1.9.33**slip**

relative translation between two elements in a *connection* (3.1.9.1) in the direction of the force

3.1.9.34**slip modulus**

ratio between load and *slip* (3.1.9.33)

3.1.10 Diaphragms**3.1.10.1****effective diaphragm**

part of a diaphragm resisting in-plane forces.

3.1.10.2**cut panel**

sheathing panel (3.1.62) of a smaller dimension than the standard panel for the sheathing

3.1.10.3

diaphragm

assembly (3.1.1.1) composed of framing and one or more consecutive *sheathing panels* (3.1.10.6) connected to one or both sides of the framing

3.1.10.4

framed assembly

end-to-end extent of a framed wall, floor or roof, comprising one or more sub-assemblies

3.1.10.5

free sheathing panel edge

edge of a *sheathing panel* (3.1.10.6) not transferring in-plane shear forces into adjacent sheathing panel or into the framing

3.1.10.6

sheathing panel

structural construction product with two dominant dimensions such as wood-based panels, products of gypsum-based material, or other suitable products

3.1.11 Timber foundation piles

There are no terms related to this topic.

3.2 Symbols and abbreviations

For the purposes of this document, the following symbols apply.

3.2.1 Latin upper-case letters

$(EA)_{(X)(i)}$	axial stiffness (of i member, element or material), (in X direction)
$(EI)_{(X)(i)}$	bending stiffness (of i member, element or material), (in X direction)
$(EI)_{(X)(i),ef}$	effective bending stiffness (of i member, element or material), (in X direction)
$(EI)_{ef,i}$	effective in-plane bending stiffness of shear wall at i^{th} storey
$(GA)_{(X)(i)}$	shear stiffness (of i member, element or material), (in X direction)
$\tilde{K}$	stiffness ratio
$\tilde{N}$	loading ratio
$A_{(i)}$	cross-sectional area or contact area (of i member, element or material) of the applied force
$A_{(i),(X),ef}$	effective cross-sectional area, contact area or , effective spreading area (of i member, element or material), (in X direction) of the applied force
$E_{(i),d}$	design effect of actions (of i member, element or material)
$E_{(X)}$	modulus of elasticity (in X direction)
$E_{(X),(i)}$	modulus of elasticity (in X direction) (of i member, element or material)
$E_{(X),(i),k}$	characteristic modulus of elasticity (in X direction) (of i member, element or material)
$E_{(X),(i),mean}$	mean modulus of elasticity (in X direction) (of i member, element or material)
$E_{(X),(i),mean,fin}$	final mean modulus of elasticity (in X direction) (of i member, element or material)

$E_{(X),edge/flat,mean}$	edgewise/flatwise mean modulus of elasticity (in X direction)
$EA_{(X),(i)}$	axial stiffness (in X direction) (of i member, element or material)
$E_{c,(X)}$	compressive modulus of elasticity (in X direction)
$E_{c,(X),edge/flat}$	edgewise or flatwise compressive modulus of elasticity (in X direction)
$E_{c,(X),edge/flat,k}$	edgewise or flatwise characteristic compressive modulus of elasticity (in X direction)
$E_{c,(X),edge/flat,mean}$	edgewise or flatwise mean compressive modulus of elasticity (in X direction)
$E_{c,(X),k}$	characteristic compressive modulus of elasticity (in X direction)
$E_{c,(X),mean}$	mean compressive modulus of elasticity (in X direction)
$E_{c,(X),sat,k}$	characteristic compressive modulus of elasticity (in X direction) in fully saturated condition
$E_{c,(X),sat,mean}$	mean compressive modulus of elasticity (in X direction) in fully saturated condition
$E_{m,(X),(i)}$	bending modulus of elasticity (in X direction) (of i member, element or material)
$E_{m,(X),(i),mean}$	mean bending modulus of elasticity (in X direction) (of i member, element or material)
$E_{m,(X),edge/flat,k}$	edgewise/flatwise characteristic bending modulus of elasticity (in X direction)
$E_{m,(X),edge/flat,mean}$	edgewise/flatwise mean bending modulus of elasticity (in X direction)
$E_{t,(X),(i)}$	tensile modulus of elasticity (in X direction) (of i member, element or material)
$E_{t,(X),(i),k}$	characteristic tensile modulus of elasticity (in X direction) (of i member, element or material)
$E_{t,(X),(i),mean}$	mean tensile modulus of elasticity (in X direction) (of i member, element or material)
$E_{t,(X),edge/flat,k}$	edgewise/flatwise characteristic modulus of elasticity (in X direction)
$F_{(X),(i)}$	force or load (in X direction) (of i member, element or material)
$F_{(X),(i),Ed}$	design force (in X direction) (of i member, element or material)
$F_{(X),(i),k}$	characteristic resistance (in X direction) (of i member, element or material)
$F_{(X),(i),max}$	maximum force or load (in X direction) (of i member, element or material)
$F_{(X),(i),Rd}$	Resulting (in X direction) (of i member, element or material) design resistance
$F_{(X),(i),Rk}$	Resulting (in X direction) (of i member, element or material) characteristic resistance
$F_{acc,d}$	design accidental action
$\Sigma F_{acc,d}$	sum of accidental design forces
F_{ax}	axial force
$F_{ax,(i),Ek}$	characteristic axial force (of i member, element or material)
$F_{ax,(X),(i),Rk}$	resulting characteristic axial resistance (in X direction) (of i member, element or material)
$F_{ax,c/t,(i),d}$	design axial compressive/tension resistance (of i member, element or material)
$F_{ax,c/t,Ed}$	design axial compressive/tension force
$F_{ax,c/t,k}$	characteristic axial compressive/tension resistance
$F_{ax,c/t,Rd}$	resulting design axial compressive/tension resistance
$F_{ax,c/t,Rk}$	resulting characteristic axial compressive/tension resistance

$F_{ax,Ed}$	design axial force
$F_{ax,Rd}$	resulting design axial resistance
$F_{br,(i),d}$	design brittle failure resistance (of i member, element or material)
$F_{br,Rd}$	resulting design brittle failure capacity
$F_{bs,Rd}$	resulting design block shear capacity
$F_{c/t/v,(X),(i),d}$	compressive/tensile/lateral (in X direction) (of i member, element or material) design resistance
$F_{c/t/v,(X),(i),k}$	characteristic compressive/tension/lateral (in X direction) (of i member, element or material) resistance
$F_{c/t/v,(X),(i),Rd}$	resulting compressive/tensile/lateral (in X direction) (of i member, element or material) design resistance
$F_{c/t/v,(X),(i),Rk}$	resulting characteristic compressive/tension/lateral (in X direction) (of i member, element or material) resistance
$F_{c/t/v/la,(X),(i)}$	compressive/tensile/shear/lateral force or load (in X direction) (of i member, element or material)
$F_{c/t/v/la,(X),(i),d}$	compressive/tensile/shear/lateral (in X direction) (of i member, element or material) design force
$F_{c/t/v/la,(X),(i),Ed}$	design compressive/tensile/shear/lateral force or load (in X direction) (of i member, element or material)
$F_{cen,d}$	design force acting on the centroid of an effective area
F_{cr}	critical load
F_d	design action
$F_{D,(i-j)}$	dowel-effect contribution (per shear plane between i - and j -numbered members)
$F_{D,k}$	characteristic dowel-effect contribution
F_{dyn}	vertical dynamic force
$F_{m,d}$	design force from a moment
$F_{ps,Rd}$	design plug shear capacity
$F_{pull,k}$	characteristic head pull-through resistance
$F_{rp,d}$	design rope-effect contribution
$F_{rp,k}$	characteristic rope-effect contribution
$F_{rs,Rd}$	design row shear capacity
F_{SLS}	maximum load at serviceability limit state
$F_{sp,Rd}$	design splitting capacity
$F_{sp,Rk}$	characteristic splitting capacity
$F_{t,90,M/V,(I/III),Ed}$	design tensile force component perpendicular to grain from the transfer of bending/shear stresses located at the first and third quadrant
$F_{t,90,M/V,Ed}$	design tensile force component perpendicular to grain from the transfer of bending/shear stresses
$F_{t,M/V,d}$	design tensile force component from the transfer of bending/shear stresses

$F_{v,la/bot,d}$	design lateral/bottom shear plane resistance
$F_{w,d}$	design withdrawal resistance
$F_{w,k}$	characteristic withdrawal resistance
$G_{(X)(i)}$	shear modulus (in X direction),(of i member, element or material)
$G_{(X)(i),edge/flat,k}$	edgewise/flatwise characteristic shear modulus parallel to grain (in X direction) (of i member, element or material)
$G_{(X)(i),edge/flat,mean}$	edgewise/flatwise mean shear modulus parallel to grain
$G_{(X)(i),k}$	characteristic shear modulus (in X direction),(of i member, element or material)
$G_{(X)(i),mean}$	mean shear modulus (in X direction),(of i member, element or material)
$G_{k,i}$	characteristic permanent action i
G_{mean}	mean shear modulus
$G_{mean,fin}$	final mean shear modulus
$G_{r,mean}$	mean rolling shear modulus
H_i	inter-storey height of i^{th} storey
$I_{(i)}$	second moment of inertia (of i member, element or material)
$I_{(i),ef}$	effective moment of inertia (of i member, element or material)
$I_{mod,ef}$	effective footfall impulse
$I_{mod,mean}$	mean modal impulse
$I_{p,(i)}$	polar moment of inertia (of i member, element or material)
I_x	torsional moment of inertia
J	torsion constant
K	connection stiffness/slip modulus
$K_{(i)}$	slip modulus of connection between cross-section 2 and i -numbered cross-section/ fastener stiffness (of i member, element or material)
$K_{A,(i)}$	sliding stiffness of shear wall (of i member, element or material)
$K_{a,z,j}$	vertical-tensile stiffness of j^{th} mechanical connection parts
$K_{SLS,(X),(i)}$	mean stiffness (in X direction) (of i member, element or material) for serviceability limit state verifications
$K_{SLS,fin}$	final mean stiffness value for serviceability limit state verifications
$K_{SLS,rot}$	mean rotational slip modulus for serviceability limit state verifications
K_{ULS}	mean slip modulus for ultimate limit state verifications
$K_{ULS,fin}$	final mean slip modulus for ultimate limit state verifications
$M_{(X),(i)}$	bending moment (in X direction) (of i member, element or material)
$M_{(X),(i),cr}$	critical bending moment (in X direction) (of i member, element or material)
$M_{(X),(i),d}$	design bending moment (in X direction)(of i member, element or material)
$M_{(X),(i),Ed}$	design bending moment (in X direction)(of i member, element or material)
$M_{(X),(i),max}$	maximum bending moment (in X direction) (of i member, element or material)

$M_{(X),(i),Rd}$	resulting design bending moment (in X direction)(of i member, element or material) resistance
$M_{(X),(i),quasi,SLS}$	moment due to quasi-permanent combination of loads for serviceability limit state verifications (in X direction) (of i member, element or material)
$M_{(i)}^*$	modal mass (of mode i)
$M_{nl,(X),(i),d}$	design non-linear bending moment (in X direction)(of i member, element or material)
$M_{nl,tor,(X),(i),d}$	design non-linear torsional moment (in X direction)(of i member, element or material)
$M_{tor,cr}$	mean torsional critical moment
$M_{tor,cr,k}$	characteristic torsional critical moment
$M_{y,0.95}$	95 th percentile of the yield moment
$M_{y,k}$	characteristic yield moment
$N_{(i),d}$	design axial force (of i member, element or material)
$N_{(X),(i),cr}$	mean critical load for buckling (in X direction) (of i member, element or material)
$N_{(X),(i),cr,d}$	design critical load for buckling (in X direction) (of i member, element or material)
$N_{c,(X),quasi,SLS}$	axial compressive force due to quasi-permanent combination of loads for serviceability limit state verification (in X direction)
$N_{c/t,(X)}$	axial compressive/tensile force (in X direction)
$N_{c/t,(X),d}$	design axial compressive/tensile force (in X direction)
N_{cr}	critical force
N_d	design axial force
N_{Ed}	design axial force
$N_{pl,k}$	characteristic yield capacity of screw
N_{Rd}	design shear resistance or design normal force capacity of a connection transmitted by bond line area
P	load
Q	variable action or force
$Q_{(j)}$	(j^{th} accompanying part of) variable action
$Q_{(j),inst}$	(j^{th} accompanying part of) short-term (instantaneous) variable action
$Q_{(j),quasi}$	(j^{th} accompanying part of) long-term (quasi-permanent) variable action
R	response factor
$R_{(X)(i),0.95}$	95 th -percentile value of resistance (in X direction)(of i member, element or material)
R_d	design resistance (load-carrying capacity)
R_h	response factor for specific harmonic
R_i	response factor for i -numbered harmonic
R_k	characteristic resistance (load-carrying capacity)
R_T	stress ratio in timber structures
S_{ij}	centroid of screw i in member j

T	period of one footfall or time
T_{lf}	design service life
V	shear force or load
$V_{(i),d}$	design shear force or load (of i member, element or material)
V_{CP}	the highest horizontal force for which coupled-panel kinematic mode would occur
V_{ef}	reduced shear force induced by concentrated load F
V_{Rd}	resulting design shear force capacity
V_{ref}	reference volume
$W_{(X),(i)}$	section modulus (in X direction) (of i member, element or material)
W_{net}	section modulus of net cross-section
W_{pl}	plastic rotation of section modulus
W_{res}	section modulus of residual cross-section above and below hole
ΔN_T	spread between torsional critical moment and axial force
$\Delta N_{t,d}$	spread between design torsional critical moment and design axial force
$\Delta N_{y/z}$	spread between axial critical load and axial force
$\Delta N_{y/z,d}$	spread between design axial critical load and design axial force

3.2.2 Latin lower-case letters

$a_{(i)}$	spacing or distance (of i member, element or material)
$a_{(i),net}$	clear spacing (between i member or material)
$a_{1,i}$	spacing of the sheathing-to-framing fasteners on the i -numbered side of the framing
$a_{1/2}$	spacing parallel/perpendicular to grain
$a_{1/2,ef}$	effective spacing parallel/perpendicular to grain
$a_{1/2,m}$	spacing on/between circles
$a_{1/2,s}$	staggered spacing parallel/perpendicular to grain
a_3	spacing from the end grain to nearest fastener parallel to grain
$a_{3,ct}$	end distance parallel to grain of the centroid
$a_{3,t/c}$	loaded/unloaded end distance parallel to grain
a_4	edge distance perpendicular to grain
$a_{4,cen}$	edge distance perpendicular to grain of the centroid
$a_{4,t/c}$	loaded/unloaded edge distance perpendicular to grain
a_{fat}	coefficient representing the type of fatigue action
a_h	acceleration
$a_{R=1,h}$	baseline peak acceleration for a response factor of 1 at a harmonic frequency
$a_{real,h}$	total real acceleration
$a_{real,h,m}$	real acceleration responses in mode m

a_{rms}	root mean square value of acceleration
$a_{z,(i)}$	distance (between i member or material)
b	width
$b_{(i),(X)}$	width (of between i member or material) (in X direction)
$b_{(i),(X),\text{ef}}$	effective width (of between i member or material) (in X direction)
$b_{(i),\text{net}}$	net width (of i member, element or material)
$b_{\text{bot},(i)}$	i-numbered width of the load introduction at the bottom of a wall
$b_{90,c}$	width of the support perpendicular to grain
b_{ef}	effective width, effective spreading width
$b_{f,(c/t),\text{ef}}$	effective flange width (of the compressive/tensile zone)
$b_{f,(i)}$	flange width (between i member or material)
b_{min}	minimum width
$b_{r,\text{ef}}$	effective width of plane reinforcement
b_{sys}	effective width depending on the type of connection between the components of the laminated timber deck
d	diameter
$d_{(i)}$	diameter (of i member, element or material)
d_1	inner thread diameter
$d_{1,2}$	inner secondary thread diameter
d_2	washer or secondary thread diameter
d_h	hole diameter
$d_{h,\text{max}}$	largest hole diameter
d_{head}	head diameter
d_{sp}	inner thread diameter (of metric threaded fastener)
e	eccentricity due to e.g. equivalent bow imperfection
$e_{(X)}$	eccentricity due to e.g. equivalent bow imperfection (in X direction)
$e_{0,(X)}$	eccentricity due to e.g. initial bow imperfection (in X direction)
$e_{0+c,(X)}$	creep amplified bow imperfection (in X direction)
e_c	eccentricity of a load introduction in the compressive zone
$e_{F,i}$	eccentricity of i-numbered force
e_i	eccentricity due to e.g. equivalent bow imperfection corresponding to an equivalent length
$e_{\text{nl},(X)}$	non-linear deflection (in X direction)
$e_{\text{nl},(X),\text{fin}}$	non-linear deflection (in X direction) due to forces and moments arising from the serviceability limit state quasi-permanent load combination calculated using final modulus of elasticity and shear

$e_{nl,(X),inst}$	non-linear deflection (in X direction) due to forces and moments arising from the serviceability limit state quasi-permanent load combination calculated using instantaneous modulus of elasticity and shear
$f_{(i),c/t/v/m,(X),d}$	design compressive/tensile/(rolling) shear/bending strength (in X direction) (of i member, element or material)
$f_{(i),c/t/v/m,(X),k}$	characteristic compressive/tensile/(rolling) shear/bending strength (in X direction) (of i member, element or material)
f_1	fundamental frequency
$f_{1,beam,i}$	fundamental frequency of the supporting beam on i-named side span end
$f_{1,lim}$	fundamental frequency limit
$f_{1,rigid}$	fundamental frequency on rigid supports
$f_{a,\alpha,\beta,d}$	design anchorage strength per unit area of plate for angle α between x-direction and force and angle β between grain direction and force
$f_{a,\alpha,\beta,k}$	characteristic anchorage strength per unit area of plate for angle α between x-direction and force and angle β between grain direction and force
$f_{a,\alpha,\beta,k,ref}$	characteristic reference anchorage strength per unit area of plate for angle α between x-direction and force and angle β between grain direction and force
$f_{ax,k}$	characteristic withdrawal strength or parameter
$f_{b,2,d}$	design bond line strength
$f_{b,2,k}$	characteristic bond line strength
$f_{c/t,p,\alpha,k}$	characteristic compressive/tensile strength per unit width of the plate for angle α
$f_{c/t,w,d}$	design compressive/tensile bending strength of web
$f_{c/t/v/m,(X),flat/edge,k}$	characteristic flatwise/edgewise compressive/tensile/shear/bending strength (in X direction)
$f_{c/t/v/m,(X),k,sat}$	characteristic compressive/tensile/(rolling) shear/bending strength (in X direction) in fully saturated condition
$f_{c/t/v/m,l,d}$	design compressive/tensile/(rolling) shear/bending strength of lamination
f_d	design strength property (stress-carrying capacity)
$f_{fat,d}$	design fatigue strength
$f_{h,(i),k}$	characteristic embedment strength (of i member, element or material)
$f_{h,(X),k}$	(in X direction)
$f_{h,k}$	characteristic embedment strength
$f_{head,0.95}$	95th percentile head pull-through strength
$f_{head,k}$	characteristic head pull-through strength or parameter
f_k	characteristic strength property
$f_{n,m}$	natural frequency of mode m
$f_{p,n,(X),k}$	characteristic normal strength per unit width of the plate (in X direction)
$f_{r,d}$	design rolling shear strength
$f_{r,k}$	characteristic rolling shear strength

$f_{\text{tor,node,d}}$	design torsional shear strength of bond lines between laminations of adjacent orthogonal layers
$f_{\text{tor,node,k}}$	characteristic torsional shear strength of bond lines between laminations of adjacent orthogonal layers
$f_{\text{u},0.95}$	95th percentile of tensile strength
$f_{\text{u,k}}$	characteristic tensile strength of dowel-type fasteners
$f_{\text{u,min}}$	minimum wire strength
$f_{\text{v,ref,k}}$	characteristic reference shear strength
f_{w}	walking frequency
$f_{\text{w},0.95}$	95th percentile of withdrawal strength
$f_{\text{w,d}}$	design withdrawal strength
$f_{\text{w,k}}$	characteristic withdrawal strength
$f_{\text{w,k,ref}}$	characteristic reference withdrawal strength
f_{y}	nominal yield strength
$f_{\text{y},0.95}$	95th percentile of yield strength
$f_{\text{y,d}}$	design yield strength
$f_{\text{y,k}}$	characteristic yield strength
$f_{\text{y,mean}}$	mean yield strength
h	height or depth
$h_{(\text{c/t}),(\text{i}),\text{ef}}$	depth (of i member, element or material) in the compressive/tensile zone
$h_{(\text{i})}$	height or depth (of i member, element or material)
$h_{\text{c/t},(\text{i})}$	depth (of i member, element or material) in the compressive/tensile zone
$h_{\text{e},(\text{i})}$	distance from loaded edge to the location where the full connection force is transmitted (of i member, element or material)
$h_{\text{e,net}}$	distance from loaded edge to the location where the full connection force is transmitted reduced by the allowed geometrical deviation due to misalignment
h_{ef}	effective height or depth
h_{eq}	equivalent depth
h_{h}	hole height
h_{ref}	reference depth
$h_{\text{ref,flat}}$	reference height for flatwise bending
$h_{\text{rl/ru}}$	residual depth at the lower/upper edge
h_{rp}	plane reinforcement height
h_{s}	member depth at support
Δh	variation of depth or height
i	notch inclination or polar radius of gyration
i_{bow}	equivalent bow imperfection

i_{sway}	equivalent sway imperfection
i_{twist}	twist imperfection
k	stiffness per metre
k_{90}	factor for the calculation of the characteristic embedment strength
k_{bj}	butt-joint factor
k_{br}	increase factor for spacings in brittle failure calculation
k_{c}	reduction factor accounting for stability effects due to compressive stresses
$k_{\text{c},90}$	stress spreading factor
$k_{\text{c},90,\text{CLT}}$	stress spreading factor for cross laminated timber
$k_{\text{c},y/z}$	reduction factor accounting for stability effects about the y- or z- axis due to compressive stresses
k_{comb}	sheathing combination factor
$k_{\text{con},0}$	factor for the number of columns of fasteners parallel to grain within a connection
$k_{\text{con},90}$	factor for the number of columns of fasteners perpendicular to grain within a connection
k_{couple}	factor for the reduced lever arm between stabilizing forces
k_{def}	creep deformation factor
$k_{\text{def},i}$	creep deformation factor for i-numbered wood-based material
k_{dens}	reference density factor
k_{diam}	factor for the stress distribution and the location of crack onset
k_{dis}	factor accounting for effects of the stress distribution in the apex zone
k_{DLF}	dynamic load factor
k_{dyn}	dynamic amplification factor
$k_{\text{e},2}$	frequency factor for the transverse floor stiffness
$k_{\text{E}90}$	transverse system modulus of elasticity factor
k_{ecc}	factor for the eccentric position of a load
$k_{\text{ecc},b}$	factor for the eccentric position of a load for the braced member
$k_{\text{ecc},\text{I/III}}$	factor for the effect of an eccentricity on the transfer of shear stresses for the first and third quadrant
k_{fat}	fatigue reduction factor
k_{fb}	factor for the influence of boundary conditions
k_{G}	fracture parameter
$k_{\text{G}05}$	adjustment factor for the shear modulus
$k_{\text{G}90}$	transverse system shear modulus factor
k_{H}	factor for the influence of the end-grain wood
k_{h}	depth modification factor
$k_{\text{h},\text{max}}$	maximum depth modification factor

$k_{h,v}$	depth modification factor for shear strength
k_i	i-numbered modification factor
$\prod k_i$	product of applicable modification factors
k_k	factor for non-uniform distribution of stresses in the plane reinforcement
k_{ka}	factor for the distribution of tensile stresses perpendicular to grain along the beam axis
k_l	length modification factor
$k_{l,ap}$	factor for increased bending stresses in the apex zone
$k_{l,max}$	maximum length modification factor
k_m	reduction factor accounting for stability effects due to bending stresses
$k_{m,\alpha}$	factor for a stress combination at the tapered edge
k_{mat}	factor for the material behaviour/material parameter for the number of lamellae/reduction factor for the distance of the punched metal plate fastener connection from either end of a member
k_{mod}	strength modification factor for the effect of load-duration and moisture content
$k_{mod,i}$	strength modification factor for the effect of load-duration and moisture content for i-numbered wood-based material
$k_{mod,sat}$	strength modification factor for the effect of load-duration and moisture content in fully saturated condition
k_n	material constant factor
$k_{n,1}$	splitting capacity modification factor
$k_{p,ap}$	factor for effects of tensile stresses perpendicular to grain resulting from a deviation of bending stresses in an apex zone
$k_{p,c}$	factor for buckling of a panel in compression
$k_{p,model}$	model factor for the sheathing panel capacity
$k_{p,v}$	factor for buckling of a panel in shear
k_{plt}	sheathing interaction factor for the plastic behaviour of sheathing-to-framing fasteners
k_{pos}	factor accounting for a timber member position
k_q	load position factor
k_r	strength reduction factor for the effects of bending of laminations during production
$k_{r,pu}$	factor for non-linear behaviour and the strength combination
$k_{r,red}$	load-carrying resistance reduction factor accounting for a reduced spacing of shear connectors
k_{rad}	factor for the effect of the corner radius on the shear stress
k_{red}	reduction factor for the low probability of having the lowest strength over the width at the point of the maximum stress or reduction factor accounting for the fact that the exciting source is usually at same distance from the person sensing the vibration or reduction factor to account for the uneven shear stress distribution over the length of the bond line parallel to grain

$k_{\text{red,b}}$	factor for reduced width
k_{res}	factor accounting for higher modes of vibrations
$k_{\text{rp},1}$	rope effect factor
$k_{\text{rp},2}$	rope effect factor limitation
$k_{\text{s,red}}$	shear connector spacing reduction factor
k_{screw}	factor for the characteristic withdrawal strength
k_{shape}	factor for the effect of the shape
$k_{\text{sigx/sigy}}$	factor for the calculation of forces acting in the x- or y-direction of punched metal plate fasteners
k_{sim}	probability factor for constellations of identical imperfections
$k_{\text{SLS,ref}}$	mean stiffness or slip modulus for serviceability limit state verifications per metre
$k_{\text{SLS,rot}}$	mean rotational slip modulus for serviceability limit state verifications per metre
$k_{\text{SLS,rot,ref}}$	mean reference rotational slip modulus for serviceability limit state verifications per metre
k_{space}	factor for the possibility of placing up to 3 circular holes at closer spacing
k_{sys}	system strength factor
k_{t}	increase factor for tension
k_{trans}	factor for higher modes in the transient response
k_{v}	adjustment factor for shear strength or plate steel property constant
$k_{\text{v,n}}$	factor for the effect of a notch
$k_{\text{v,y/z}}$	adjustment factor for shear strength in y- or z-direction
k_{var}	factor for effects of service conditions
k_{vol}	factor for the volume effect
k_{w}	modification factor for width of punched metal plate fastener
k_{z}	coefficient determined by the tenon geometry
$k_{\alpha/\beta}$	factors for the notch geometry
k_{ρ}	reference density exponent in the determination of a withdrawal strength
k_{τ}	factor for increased shear stresses or shear distribution factor for sheathing interaction
$k_{\tau,c/t}$	factor for the effect of compressive/tensile stresses perpendicular to grain on the shear strength
$l_{(i)}$	length or span (of i member, element or material)
$l_{(i),\text{ef}}$	effective length or span (of i member, element or material)
$l_{\text{c,(X),ef}}$	effective length parallel to grain for flexural buckling (in X direction)
$l_{90,c}$	length of the support parallel to grain
l_{ef}	effective spreading length parallel to grain
l_{h}	embedment depth / hole length

$l_{m,ef}$	effective length for lateral torsional buckling
l_o	maximum opening length
$l_{p,j}$	j-numbered varying panel width
$l_{p,std}$	standard sheathing panel length
$l_{p1/2}$	length of the sheathing or fitting panel with one or two free edges
l_{per}	perimeter length of the sheathing panels
$l_{per,i}$	perimeter lengths of sheathing panels fixed to i-numbered side of the framing
$l_{per,j}$	j-numbered varying panel width
$l_{r,l/u}$	reinforced length above/below the axis prone to splitting
l_{ref}	reference length
l_s	clear spacing parallel to grain between a contact area and a concentrated load
$l_{sea/street}$	distance from sea/ roads with heavy traffic and with de-icing salt
$l_{t,90}$	distribution length for tensile stresses perpendicular to grain
$l_{t,90,M/V,(I/III)}$	distribution length for tensile stresses perpendicular to grain from the transfer of bending/shear stresses (in the first and third quadrant)
l_v	clear spacing parallel to grain between the edge of a support and a concentrated load or distance between the end of a beam and the nearest edge of a hole
$l_{v,1/2}$	end grain distance for single/double step connection
$l_{v,ef}$	effective shear length parallel to grain
$l_{w,(i)}$	withdrawal length (of i member)
$l_{w,ef}$	effective withdrawal length
m	mass or number
m_w	walker weight
$n_{(i)}$	number (of i member, element or material)
$n_{(i),mean}$	average number of rows of fasteners (of i member, element or material)
n_0	number of fasteners in a row parallel to grain
$n_{1/2}$	number of inner/outer timber members
n_{90}	number of fasteners in a row perpendicular to grain
n_{ef}	effective number of fasteners
n_h	number of the harmonic
n_{min}	minimum number of fasteners
n_{obs}	number of constant amplitude stress cycles per year
p	load or exponent accounting for the probabilistic effects on combined bending and compressive strength of the cross-section
$q_{(X),(i)}$	force (in X direction) (of i member, element or material)
q_{Ed}	design action/distributed load

$r_{(i)}$	radius or distance from the centroid of the effective plate area to the segmental plate area (of i member, element or material)
s	size effect parameter or spacing
$s_{(i)}$	spacing of fasteners (of i member, element or material)/size effect (of i member, element or material)
$s_{(i),(X),d}$	design shear stress on sheathing-to-framing fasteners per unit length acting (in X direction) to the ribs (of i member)
$s_{(X),min}$	minimum vertical shear capacity on the sheathing-to-framing fasteners per unit length acting (in X direction) to the ribs in the tension zone
s_d	resulting design load on the sheathing-to-framing fasteners per unit length
s_{ef}	effective spacing
$s_{min/max}$	minimum/maximum spacing
s_t	size effect parameter for tension
t	thickness or notch length/time
$t_{(i),min/max}$	minimum/maximum thickness (of i member, element or material)
$t_{(X)(i)}$	thickness or notch length (in X direction) (of i member, element or material)
t_{ef}	effective thickness
$t_{ef,el}$	elastic effective thickness
$t_{ef,el,2}$	remaining elastic effective thickness
$t_{ef,pl}$	plastic effective thickness
$t_{ef,ps}$	effective thickness of failure planes for partially penetrated timber members
$t_{h,(i)}$	embedment depth (of i member, element or material)
$t_{h,(i),min}$	required minimum embedment depth (of i member, element or material)
$t_{h,pl}$	plastic penetration length
t_v	notch depth
$t_{v1/2}$	front/rear notch depth of a single or double-step connection
t_w	withdrawal thickness
Σt_{pen}	sum of penetration depths
$u_{(i)}$	deformation (of i member, element or material)
$u_{(X),max}$	maximum deformation in (in X direction)
u_{CP}	maximum rocking deflection of shear wall under coupled-panel kinematic mode
$u_{G,i}$	inter-storey lateral displacement due to the in-plane shear deformation
$u_{j,tot}$	total lateral displacement of a shear wall at the top of the jth storey
u_M	displacement from the elongation in a wall anchorage system (rigid body rotation)
u_N	displacement from the axial deformation of the framing
$u_{nl,(X)}$	non-linear deformation (in X direction)
$u_{nl,(X),max}$	maximum non-linear deformation (in X direction)

$u_{S,(X)}$	displacement from the deformation of the sheathing-to-framing connection (in X direction) to the primary ribs
u_{SW}	minimum rocking deflection of shear wall under single-wall kinematic mode
u_V	displacement from the rigid body translation
$u_{z,A}$	vertical elongation of the wall anchorage system
$v(t)$	total velocity at time t
$v_{1,peak}$	peak velocity response for the fundamental mode
v_2	deflection of compressive members
$v_m(t)$	velocity in each mode at time t
$v_{m,peak}$	peak velocity in each mode
$v_{R=1}$	baseline velocity
v_{rms}	root mean square velocity response
$v_{tot,peak}$	total peak velocity response
w	deformation
w_{pl}	steel plate width
Δw	relative deformation of member from rotation at edge of contact
w_0	precamber in the unloaded structural member
w_1	initial part of the deformation under permanent (including quasi-permanent) loads of the relevant combination of actions
w_{1kN}	maximum deflection due to a vertical static point load of 1 kN
w_2	long-term part of the deformation under permanent loads including the quasi-permanent part of variable actions
w_3	instantaneous deformation due to variable actions excluding their quasi-permanent part
$w_{beam,1/2}$	deflection of the supporting beam 1 or 2 caused by a vertical static point load of 0,5 kN
w_{lim}	limit of maximum deflection due to a vertical static point load of 1 kN
$w_{lim,max}$	upper deflection limit
w_{max}	remaining total deformation accounting for precamber
w_{nl}	non-linear deflection
w_{PMPF}	effective punched metal plate fastener width
w_{rigid}	deflection of a floor between rigid supports caused by a vertical static point load of 1 kN
w_{SLS}	compressive deformation perpendicular to grain
$w_{SLS,z}$	compressive deformation of the bottom rail perpendicular to grain
w_{sys}	deflection of a single span floor (including the effect of any supporting beams, shear and connections in composite structures) under the load induced by the floor mass m
w_{tot}	total deformation

x	distance parallel to grain from the line of action of the support reaction to the corner of the notch
z_i	distance of the i-numbered fastener from the centre of rotation of the joist hanger
$z_{\max}$	distance of the uppermost fastener from the centre of rotation of the joist hanger

3.2.3 Greek upper-case letters

$\Delta_{1st,lim}$	maximum admissible deflection from first order analysis superimposing to initial imperfection e_0
$\Delta_{nl,lim}$	upper limit for deflection share induced by geometrical non-linear amplification
ΔQ	bracing reaction force
$\Delta_{y/z}$	deflection of bracing system
ϕ	equivalent sway imperfection
ϕ_0	initial sway
$\phi_{c,y/z}$	intermediate parameter for the calculation of $k_{c,y/z}$
ϕ_m	intermediate parameter for the calculation of k_m
ϕ_s	sway at ridge kink point, including imperfection and deformation
$\Delta_{1st,lim}$	maximum admissible deflection from first order analysis superimposing to initial imperfection e_0

3.2.4 Greek lower-case letters

$\alpha_{(i)}$	angle, ratio, factor or stress spreading gradient (of i member, element or material) or inclination of rainfall
$\alpha_{a,m}$	parameter for the calculation of real and imaginary acceleration
$\alpha_{c,y/z}$	amplification factor for critical normal forces for y- or z-direction
α_{cl}	factor related to the clamping condition of fastener
$\alpha_{load,(i)}$	angle of load dispersion (of i member, element or material)
α_m	amplification factor for critical bending moments
$\beta_{(i)}$	ratio, factor or angle (of i member, element or material)
$\beta_{a,m}$	parameter for the calculation of real and imaginary acceleration
$\beta_{c,y/z}$	imperfection factor for flexural buckling about y- or z-axis
β_{fat}	coefficient representing the type of fatigue action
β_m	bow imperfection factor for lateral torsional buckling
β_θ	twist imperfection factor for lateral torsional buckling
γ_0	plate steel property constant
$\gamma_{M,\gamma_{M1},\gamma_{M2}}$	partial factor for material property
$\gamma_{M,con}$	partial factor for connection
$\gamma_{M,fat}$	partial factor for fatigue resistance

$\gamma_{M,NA}$	partial factor in the National Annex
$\gamma_{M,s}$	partial factor for prestressing steel elements
$\gamma_{M,tim}$	partial factor for timber
γ_P	partial factor for prestressing forces
γ_R	partial factor for resistance
$\delta_{(i)}$	ratio, factor or angle (of i member, element or material) / factor for efficiency of mechanical connections (of i member, element or material)
ε	(insertion) angle
ε_0	non-dimensional bow imperfection
$\varepsilon_{u,tim}$	failure strain of timber parallel to grain
ζ	damping ratio
η	parameter or factor
$\theta_{(i)}$	rotation angle (of i member, element or material)
θ_0	initial twist imperfection
θ_{0+c}	creep amplified twist imperfection
θ_{max}	total rotation at midspan
θ_{max}	equivalent rotation at midspan
θ_{nl}	non-linear twist deformation
$\theta_{nl,fin}$	non-linear twist deformation from quasi-permanent load combination using final modulus of elasticity and shear
$\theta_{nl,inst}$	non-linear twist deformation from serviceability limit state quasi-permanent load combination using instantaneous modulus of elasticity and shear
θ_{sup}	equivalent sway imperfection at a fork support
θ_{twist}	equivalent twist imperfection
κ	shear correction factor
λ	slenderness ratio for a solid column
λ_1	slenderness ratio for shaft
$\lambda_{c,y/z,rel}$	relative slenderness ratio for flexural buckling about y- or z-axis
λ_{ef}	effective slenderness ratio
$\lambda_{m,rel}$	relative slenderness ratio for lateral torsional buckling
λ_{tot}	total slenderness ratio
$\lambda_{z,rel}$	relative slenderness ratio about z-axis
μ	friction coefficient
$\mu_{(X)}$	friction coefficient (in X direction)
μ_B	notch depth ratio
$\mu_{e,m}$	mode shape at excitation point
$\mu_{r,m}$	mode shape at response point

μ_{res}	resonant build-up factor
μ_t	modification factor for plate moment in tension splices
μ_λ	value in the calculation of lattice columns with glued or nailed joints
$\rho_{(i)}$	density (of i member, element or material)
$\rho_{(i),k}$	characteristic density (of i member, element or material)
$\rho_{(i),\text{mean}}$	mean density (of i member, element or material)
$\rho_{\text{ref},(i),k}$	characteristic reference density (of i member, element or material)
$\rho_{\text{ref},(i),\text{mean}}$	mean reference density (of i member, element or material)
$\sigma_{(i),c/t/m,(X)}$	compressive/tensile/bending stress (in X direction) (of i member, element or material)
$\sigma_{(i),c/t/m,(X),d}$	design compressive/tensile/bending stress (in X direction) (of i member, element or material)
$\sigma_{(i),c/t/m,(X),\text{max},d}$	max design compressive/tensile/bending stress (in X direction) (of i member, element or material)
$\sigma_{\text{fat},\text{min}/\text{max},d}$	design minimum/maximum fatigue stress
$\sigma_{m,(X),\text{cr}}$	critical bending stress (in X direction)
$\sigma_{w,d}$	design withdrawal stress
τ	shear stress
$\tau_{(i),\text{max}}$	maximum shear stress (of i member, element or material)
$\tau_{(X),d}$	design shear stress (in X direction)
$\tau_{F,d}$	design anchorage stress imposed by force
$\tau_{M,d}$	design anchorage stress imposed by moment
$\tau_{\text{max},d}$	maximum design shear stress
$\tau_{r,d}$	design rolling shear stress
$\tau_{\text{tor},(i),d}$	design torsional stress (of i member, element or material)
$\varphi_{(i)}$	rotation or angle (of i member, element or material)
$\varphi_{B,(j)}$	rotation due to panel bending deformation at the top of shear wall at (j)th storey
$\varphi_{C,(j)}$	rotation contribution due to compression perpendicular to grain of the shear wall at (j)th storey
$\varphi_{R,(j)}$	rotation contribution due to shear wall rocking at (j)th storey
$\psi_{0,j}$	combination factor applied to an accompanying variable action
$\psi_{1,1}$	combination factor applied to the leading variable action to determine its frequent value
$\psi_{2,1}$	combination factor applied to the leading variable action to determine its quasi-permanent value
$\psi_{2,j}$	combination factor applied to an accompanying variable action to determine its quasi-permanent value
$\omega_{\text{low},\text{mean}}$	lower limit of average moisture content

ω_{mean}	yearly average moisture content
$\omega_{\text{up,mean}}$	upper limit of average moisture content
$\Delta\omega_1$	variation of average moisture to calculate dimensional changes of section
$\Delta\omega_2$	moisture difference to estimate drying cracks in the zone of a member close its surface
$\Delta\omega_3$	moisture variation at surface

3.2.5 Indices

For the purposes of this document, the following indices apply.

NOTE Abbreviations given in 3.2.6 are also used in the explanation of symbols.

0	parallel to grain
0,90	in-plane
1	spacing parallel to grain
2	spacing perpendicular to grain
3	end spacing
4	edge spacing
45	45 degrees to grain
90	perpendicular to grain
A	anchorage system
acc	accidental
anc	anchor
ap	apex/taper
ax	axial
beam	beam
bj	butt-joint
bot	bottom
br	brittle
bs	block-shear
c	compression/unloaded end
cen	centroid
con	connector/fastener
cp	coupled-panel
cr	critical
d	resistance
D	dowel-effect /diagonal
def	deformation

dens	density
dowel	dowel
drill	drill hole
dyn	dynamic effect
ecc	eccentric
Ed	design force
edge	edgewise
ef	effective
eq	equivalent
f	flange
fat	fatigue
fin	final
flat	flatwise
fuse	fuse
h	harmonic/ embedment/hole
H	hanger
I/III	first/third quadrant
imag	imaginary
in	inner
inst	instantaneous
J	joist
k	characteristic
l	lamination
la	lateral
load	load
low	lower
m	bending
mat	material
max	maximum
mean	mean
mid	middle
mod	modal
nb	not bonded
net	net cross-section or clear spacing/distance
nl	non-linear
o	opening

olap	overlap
osc	oscillation
p	polar/sheathing/plate
pl	plastic / connector plate or field splice plates
plate	plate
ps	plug-shear
pull	head pull-through
quasi	quasi-permanent combination
r	rolling shear/reinforcement
Rd	resulting design capacity
ref	reference
res	residual
rib	rib
Rk	resulting characteristic capacity
rot	rotational
rp	rope
rs	row-shear
s	staggered spacing/steel
sat	saturated
screw	screw
sf	sheathing to framing
shape	shape
SLS	serviceability limit state
sp	splitting
ST	discrete transverse
SW	shear wall
T	transverse
t	tensile/loaded end
ten	tenon
tim	timber
top	top
tor	torsional
tot	total
up	upper
v	shear/lateral
w	withdrawal

x	about x-axis
y	about y-axis /yield limit
z	about z-axis
α	angle to grain
β	angle between force and grain
θ	twist

3.2.6 Abbreviations

For the purposes of this document, the following abbreviations apply.

BGL	Block glued glulam
C _E	category for corrosion resistance in atmosphere
CC	Consequence class
CE	Atmospheric exposure class
CL	Cross layered timber
CLT	Cross laminated timber
CPB	Cement-bonded particleboard
CRC	Corrosion resistance class
DC	Durability class
DLW	Non-impregnated densified laminated wood
DoP	Declaration of Performance
EAD	European Assessment Document
EN	European standard
FST	Structural finger jointed timber
GFB	Gypsum fibreboard
GLT	Glued laminated timber
GLVL	Glued laminated veneer lumber
GLVL-C	Glued laminated veneer lumber with crossband veneers
GLVL-P	Glued laminated veneer lumber with parallel veneers
GPB	Gypsum plasterboard
GST	Glued solid timber
GYB	Gypsum-based
HB	Fibreboard, hard
hEN	Harmonized European Standard
LVL	Laminated veneer lumber
LVL-C	Laminated veneer lumber with crossband veneers
LVL-P	Laminated veneer lumber with parallel veneers
MB	Fibreboard, medium
MDF	Dry process fibreboard
OSB	Oriented strand board

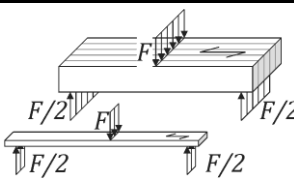
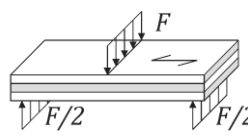
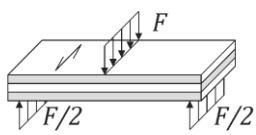
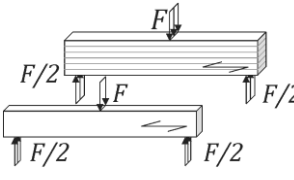
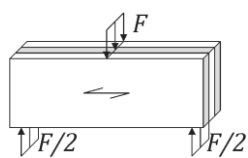
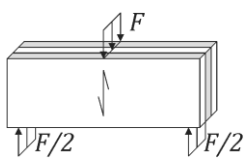
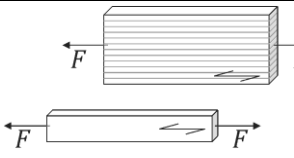
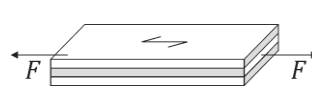
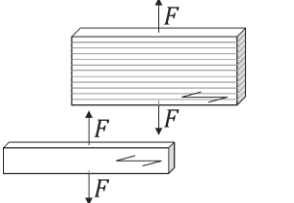
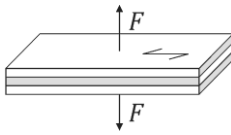
pH	potential of hydrogen (acidity or basicity of aqueous solutions)
PL	Parallel laminated timber
PMPF	Punched metal plate fastener
PW	Plywood
RPB	Resinoid-bonded particleboard
SB	Softboard
SC	Service class
SL	Structural lumber
SLS	Serviceability limit state
ST	Structural timber
STB	Strand based
SWB	Solid wood-based
SWP	Solid wood panel
SWP-C	Multi-layered solid wood panel
SWP-P	Single layered solid wood panel
T _E	corrosion resistance category in timber
TS	Technical specification
TTC	Timber-timber-composite
ULS	Ultimate limit state
VB	Veneer-based
WFB	Wood-fibre-based
WPB	Wood-particle-based

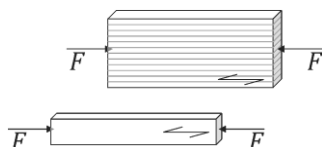
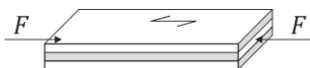
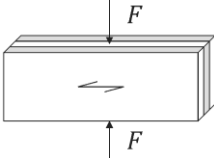
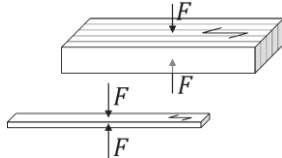
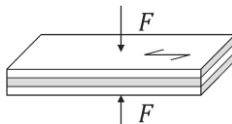
3.2.7 Denomination of strengths, stiffnesses, densities, forces, moments, and stresses

The denominations of stresses, stiffnesses and densities may be taken from Table 3.1.

NOTE Formulas in this document which are applicable to multiple timber products (see Table 5.1) have been written using the symbols relevant for structural lumber (SL). Table 3.1 gives the equivalent symbols for use with other timber products.

Table 3.1 — Symbols for strengths, moduli of elasticity and shear moduli ^{a, b}

Symbols usually used in EN 1995-1-1	Verification of gross cross-section e.g. parallel laminated timber (PL)	Verification of net cross-section e.g. cross laminated timber (CLT) ^c	Verification of gross cross-section e.g. veneer based products (VB)	
$f_m, s_{m,flat}^e$ $f_v, f_r, s_{v,flat}^e$ E G, G_v, G_r	 f_m f_v E_0 G	for the considered direction f_m f_v and f_r E_0 G and G_r	 $f_{m,0}$ or $f_{m,0,flat}^d$ with $s_{m,flat}^e$ $f_{r,0}$ or $f_{v,0,flat}^d$ with $s_{v,flat}^e$ $E_{m,0}$ $G_{r,0}$	 $f_{m,90}$ or $f_{m,90,flat}^d$ $f_{r,90}$ or $f_{v,90,flat}^d$ $E_{m,90}$ $G_{r,90}$
f_m, s^d f_v and/or $f_{tor,node}$ E $G, G_v, G_0, G_{0,edge}, G_p$	 f_m f_v E_0 G	for the considered direction $f_{m,edge}$ $f_{v,xy}$ and $f_{tor,node}$ E_0 G_{xy}	 $f_{m,0,edge}$ with s^d or $f_{p,0}$ $f_{v,0,edge}$ or $f_{v,0}$ $E_{m,0}$ or $E_{p,0}$ G_v or $G_{v,0}$	 $f_{m,90,edge}$ or $f_{p,90}$ $f_{v,90,edge}$ or $f_{v,90}$ $E_{m,90}$ or $E_{p,90}$ G_v or $G_{v,90}$
$f_{t,0}$ $E_{t,0}$	 $f_{t,0}$ $E_{t,0}$	for the considered direction $f_{t,0}$ $E_{t,0}$	 $f_{t,0}$ with s^d or s_t^f $E_{t,0}$	 $f_{t,90,edge}$ or $f_{t,90}$ $E_{t,90}$
$f_{t,90}$ E_{90}	 $f_{t,90}$ E_{90}	$f_{t,90}$ E_{90}	 $f_{t,90}$ or $f_{t,90,flat}^d$ E_{90}	

Symbols usually used in EN 1995-1-1	Verification of gross cross-section e.g. parallel laminated timber (PL)	Verification of net cross-section e.g. cross laminated timber (CLT) ^c	Verification of gross cross-section e.g. veneer based products (VB)	
$f_{c,0}$ $E_{c,0}$	 $f_{c,0}$ $E_{c,0}$	for the considered direction $f_{c,0}$ $E_{c,0}$	 $f_{c,0}$ $E_{c,0}$	 $f_{c,90,edge}^d$ or $f_{c,90}$ $E_{c,90,edge}^d$ or $E_{c,90}$
$f_{c,90}$ E_{90}	 $f_{c,90}$ E_{90}	$f_{c,90}$ E_{90}	 $f_{c,90}$ or $f_{c,90,flat}$ E_{90} or $E_{90,flat}$	
^a This table is based on symbols given in the different product standards. ^b If alternative symbols are given in this table (indicated by “or”), they refer to different products or different directions. In the case of “and” both symbols are typically needed for one design situation. ^c Layer properties for cross laminated timber (CLT), if any, are referring to the element’s directions x and y. For the design with reference to the layers these indices are omitted (as not required). The properties refer to grain direction of the considered layer and symbols are in accordance with EN 338. ^d For laminated veneer lumber (LVL) and Glued laminated veneer lumber (GLVL). ^e Only for glued laminated veneer lumber (GLVL). ^f Only for hardwood glued laminated veneer lumber (GLVL).				

4 Basis of design

4.1 General rules

(1) The design of timber structures shall be in accordance with the general rules given in EN 1990 and the specific design provisions for timber structures given in this document.

(2) The provisions in EN 1990 regarding robustness should be considered.

NOTE 1 Designing for robustness is more related to the structural concept, redundancy, adequate choice of structural materials and connections, and structural detailing than to complex analyses.

NOTE 2 Indicative design methods for providing enhanced robustness based on consequence class (CC) of the structure are given in EN 1990:2023, Tables E.1 and E.2.

NOTE 3 Further information about enhancing the robustness of timber structures can be found in A.3.

4.2 Principles of limit state design

4.2.1 Ultimate limit states (ULS)

(1) The following ultimate limit states shall be verified, if relevant:

- failure of cross-sections, contact areas and members, see Clause 8;
- failure of members due to fatigue, see Clause 10;
- failure of connections, see Clause 11;
- failure of planar elements resisting diaphragm action, see Clause 12;
- failure of timber foundation piles, see Clause 13.

4.2.2 Serviceability limit states (SLS)

(1) The verification of serviceability limit states should be based on criteria concerning:

- deformations, see 9.2;
- vibrations, see 9.3;
- in-plane deformations of framed walls, see 12.3.3;
- in-plane deformations of framed floors, see 12.4.5.

4.3 Basic variables

4.3.1 Actions and environmental influences

4.3.1.1 General

(1) Actions to be used in the design of timber structures shall be taken from the relevant parts of the EN 1991 series and EN 1998 series, and combined in accordance with EN 1990.

(2) In special cases, project specific actions, based on special conditions or activities not covered in the documents mentioned in 4.3.1.1(1), may be assigned.

NOTE A self-weight of 5 kN/m^3 , which includes an allowance for the additional weight from common steel connections, is usually a conservative assumption for solid wood-based products made of softwood.

4.3.1.2 Moisture content

(1) The effects of moisture content changes in the timber shall be considered. These effects include:

- actions due to restricted dimensional changes (internal stresses);
- shrinkage cracks.

NOTE 1 Moisture content changes in timber are caused, e.g. by changes in the surrounding air temperature and/or relative humidity, or by direct contact with water or adjoining materials.

NOTE 2 A schematic representation of moisture content profile of a timber cross-section at high and low moisture content is shown in Figure 4.1.

NOTE 3 The effect of shrinkage cracks is implicitly included in 8.1.11.

(2) The effects of moisture content changes in the timber should be minimized. Before using it in construction, timber should be conditioned to the moisture content appropriate to the intended climatic

conditions in the building during its utilization phase, unless the timber is able to desorb or absorb moisture without any detrimental effect on the load-carrying capacity or stiffness of the structure.

NOTE 4 Measures to control moisture content changes during transport and erection are given in EN 1995-3.

4.3.1.3 Load-duration classes

(1) Actions shall be assigned to load-duration classes for ultimate and serviceability limit state verifications.

NOTE Assignment of load-duration classes are given in Table 4.1 (NDP) unless the National Annex gives different assignments.

(2) For a variable action, the appropriate load-duration class shall be determined based on an estimate of the typical duration of the effects of the action.

Table 4.1 (NDP) — Load-duration classes and examples of load-duration assignment

Load-duration class	Accumulated duration of characteristic load	Examples of loading (NDP)
Permanent	more than 10 years	self-weight, prestress
Long-term	6 months – 10 years	storage
Medium-term	1 week – 6 months	imposed floor load, snow
Short-term	less than one week	snow, wind
Instantaneous	usually less than one minute	wind, impact, seismic action
NOTE The load-duration classes are characterised by the effect of a constant load acting for a certain period during the design service life of the structure.		

4.3.1.4 Service classes (SC)

(1) Structures or, where appropriate, parts of a structure or individual members shall be assigned to one of the service classes defined in Table 4.2.

NOTE 1 The moisture content in a member is dependent on, for example, the member section size, the building type, building use, location of the building, building climate control as well as on the seasonal external climate.

NOTE 2 The following assignments can be used unless the National Annex gives different assignments:

- SC 1: members inside insulated and heated buildings;
- SC 2: members under shelter (i.e. not exposed to rain), in non-insulated and unheated conditions;
- SC 3: members exposed to weather and with capacity for re-drying;
- SC 4: members submerged in soil or water (e.g. foundation piles and marine structures).

(2) For assigning service class to calculate strength values and deformations under defined environmental conditions, the upper limits of relative humidity for each service class in Table 4.2 should be used.

(3) The yearly average relative humidity over a minimum ten-year period should be used to assign timber members to timber corrosivity categories for steel dowel-type fasteners and for steel connectors, in accordance with 6.3. For this purpose the yearly average relative humidity for each service class given in Table 4.2 and Figure 4.1 should be used.