DIN EN 1995-1-1



ICS 91.010.30; 91.080.20

has the exclusive right of s

Supersedes: see below

lin.de

th.de

1737539

02 11

Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings (includes Corrigendum AC:2006 + Amendment A1:2008) English translation of DIN EN 1995-1-1:2010-12 Eurocode 5: Bemessung und Konstruktion von Holzbauten -Teil 1-1: Allgemeines – Allgemeine Regeln und Regeln für den Hochbau (enthält Berichtigung AC:2006 + Änderung A1:2008) Englische Übersetzung von DIN EN 1995-1-1:2010-12 Eurocode 5: Conception et calcul des structures en bois -Partie 1-1: Généralités – Règles communes et règles pour les bâtiments (Corrigendum AC:2006 + Amendement A1:2008 inclus) Traduction anglaise de DIN EN 1995-1-1:2010-12 Supersedes DIN EN 1995-1-1:2008-09; together with DIN EN 1995-1-1/NA:2010-12, supersedes DIN 1052:2008-12 and DIN 1052 Corrigendum 1:2010-05; supersedes DIN EN 1995-1-1 Corrigendum 1:2010-04 Document comprises 126 pages Translation by DIN-Sprachendienst. In case of doubt, the German-language original shall be considered authoritative. No part of this translation may be reproduced without prior permission of DIN Deutsches Institut für

This is a preview. Click here to purchase the full publication.

A comma is used as the decimal marker.

National foreword

This standard has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes" (Secretariat: BSI, United Kingdom).

The responsible German body involved in its preparation was the *Normenausschuss Bauwesen* (Building and Civil Engineering Standards Committee), Working Committee NA 005-04-01 AA *Holzbau*.

This document includes Amendment A1:2008, approved by CEN on 10 April 2008 and Corrigendum AC:2006, approved by CEN on 7 June 2006.

In Germany, this standard is to be applied in conjunction with the National Annex.

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

The start and finish of text introduced or altered by amendment or corrigendum is indicated in the text by tags $(A_1) \circ (A_2) \circ (A_2)$.

Amendments

This standard differs from DIN EN 1995-1-1:2005-12 as follows:

- a) normative references have been updated and new symbols have been added in Subclause 1.6;
- b) Subclauses 1.6, 2.1.3, 2.2.2, 2.2.3, 3.2, 3.3, 3.4, 6.1.5, 6.1.7, 6.3.3, 6.4.3, 8.1.3, 8.2.3, 8.3.1, 8.3.2, 8.5.1.1, 8.4, 8.7.2, 8.8.5.2, 8.10, 9.2.4.2, 9.2.4.3.2 and 10.4.5 have been revised and restructured;
- c) Tables 3.1 and 3.2 have been revised;
- d) Equations (A.3) and (A.7) in Annex A have been revised;
- e) Subclauses C.3.1 and C.3.2 in Annex C have been revised and restructured.

Compared with DIN EN 1995-1-1:2008-09, DIN EN 1995-1-1 Corrigendum 1:2010-04, DIN 1052:2008-12 and DIN 1052 Corrigendum 1:2010-05, the following corrections have been made:

- a) the standard has been based on European design rules;
- b) superseding notes have been corrected;
- c) this standard is the consolidated version of the previous 2004 edition with Corrigendum 1:2010-04;
- d) the standard has been editorially revised.

Previous editions

DIN 1052: 1933-07, 1938-05, 1940-10x, 1947-10, 1965-08, 2004-08, 2008-12 DIN 1052-1: 1969-10, 1988-04 DIN 1052-1/A1: 1996-10 DIN 1052-2: 1988-04, 1996-10 DIN 1052-2/A1: 1996-10 DIN 1052-3: 1988-04 DIN 1052-3/A1: 1996-10 DIN 1052 Corrigendum 1: 2010-05 DIN V ENV 1995-1-1: 1994-06 DIN EN 1995-1-1: 2005-12, 2008-09 DIN EN 1995-1-1 Corrigendum 1: 2010-04 - This page is intentionally blank -

EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

EN 1995-1-1

November 2004

+ AC + A1

June 2006 June 2008

ICS 91.010.30; 91.080.20

Supersedes ENV 1995-1-1:1993

English version

Eurocode 5: Design of timber structures — Part 1-1: General — Common rules and rules for buildings

Eurocode 5: Conception et calcul des structures en bois — Partie 1-1 : Généralités — Règles communes et règles pour les bâtiments Eurocode 5: Bemessung und Konstruktion von Holzbauten — Teil 1-1: Allgemeines — Allgemeine Regeln und Regeln für den Hochbau

EN 1995-1-1:2004 was approved by CEN on 2004-04-16, Corrigendum AC:2006 on 2006-06-07 and Amendment A1:2008 on 2008-04-10.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION COMITÉ EUROPÉEN DE NORMALISATION EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2008 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 1995-1-1:2004 + AC:2006 + A1:2008 E

This is a preview. Click here to purchase the full publication.

Contents		Page
Foreword		6
	to EN 1995-1-1:2004/A1:2008 🔄	6
SECTION 1	GENERAL	10
1.1 Sco	DPE	10
1.1.1		10
1.1.2		10
	RMATIVE REFERENCES	11
1.3 Ass 1.4 Dis	SUMPTIONS TINCTION BETWEEN PRINCIPLES AND APPLICATION RULES	13 13
	TINCTION BETWEEN PRINCIPLES AND APPLICATION RULES	13
	General	13
1.5.2		13
-	/BOLS USED IN EN 1995-1-1	14
SECTION 2	BASIS OF DESIGN	19
2.1 RE0	QUIREMENTS	19
2.1.1		19
	Reliability management	19
2.1.3		19
	NCIPLES OF LIMIT STATE DESIGN	19
2.2.1		19
	Ultimate limit states	19
2.2.3	· · · · · · · · · · · · · · · · · · ·	20
	SIC VARIABLES	21
2.3.1	Actions and environmental influences General	21 21
	Load-duration classes	21
	Service classes	22
	Materials and product properties	22
	Load-duration and moisture influences on strength	22
2.3.2.2		22
2.4 VEF 2.4.1	RIFICATION BY THE PARTIAL FACTOR METHOD	24 24
	Design value of material property Design value of geometrical data	24 25
2.4.2	Design resistances	25
2.4.4	Verification of equilibrium (EQU)	25
SECTION 3	MATERIAL PROPERTIES	26
3.1 Gei	NERAL	26
3.1.1	Strength and stiffness parameters	26
3.1.2		26
3.1.3	0	26
3.1.4	Deformation modification factors for service classes	26
		26
	JED LAMINATED TIMBER	27 28
	1INATED VENEER LUMBER (LVL) OD-BASED PANELS	20 29
	HESIVES	29
	TAL FASTENERS	29
SECTION 4	DURABILITY	30
4.1 Res	SISTANCE TO BIOLOGICAL ORGANISMS	30
	SISTANCE TO CORROSION	30

SECTION 5	BASIS OF STRUCTURAL ANALYSIS	31
	NERAL	31
	MBERS	31
5.3 Co	NNECTIONS	31
5.4 Ass	SEMBLIES	32
5.4.1		32
5.4.2	Frame structures	32
5.4.3	Simplified analysis of trusses with punched metal plate fasteners	33
5.4.4	Plane frames and arches	34
SECTION 6	ULTIMATE LIMIT STATES	36
	SIGN OF CROSS-SECTIONS SUBJECTED TO STRESS IN ONE PRINCIPAL DIRECTION	36
6.1.1	General	36
6.1.2	Tension parallel to the grain	36
6.1.3	Tension perpendicular to the grain	36
6.1.4	Compression parallel to the grain	36
6.1.5	Compression perpendicular to the grain	36
6.1.6	Bending	38
6.1.7	Shear	38
6.1.8	Torsion	39
	SIGN OF CROSS-SECTIONS SUBJECTED TO COMBINED STRESSES	40
6.2.1		40
6.2.2	Compression stresses at an angle to the grain	40
6.2.3		40
6.2.4	Combined bending and axial compression	40
	ABILITY OF MEMBERS	41
6.3.1		41
6.3.2	Columns subjected to either compression or combined compression	
and ben	•	41
6.3.3	Beams subjected to either bending or combined bending and compression	42
	SIGN OF CROSS-SECTIONS IN MEMBERS WITH VARYING CROSS-SECTION OR CURVED	
SHAPE		44
6.4.1		44
6.4.2	5 1	44
6.4.3	Double tapered, curved and pitched cambered beams	45
	TCHED MEMBERS	49
6.5.1	General	49
6.5.2		49
	STEM STRENGTH	50
	SERVICEABILITY LIMIT STATES	52
	NT SLIP	52
	ITING VALUES FOR DEFLECTIONS OF BEAMS	52
-	RATIONS	53
7.3.1		53
7.3.2		53
7.3.3	Residential floors	53
SECTION 8	CONNECTIONS WITH METAL FASTENERS	56
8.1 GE	NERAL	56
8.1.1	Fastener requirements	56
8.1.2	Multiple fastener connections	56
8.1.3		56
8.1.4	Connection forces at an angle to the grain	56
8.1.5	Alternating connection forces	58
8.2 LAT	ERAL LOAD-CARRYING CAPACITY OF METAL DOWEL-TYPE FASTENERS	58
8.2.1	General	58

DIN EN 1995-1-1:2010-12 EN 1995-1-1:2004 + AC:2006 + A1:2008 (E)

 8.2.2 Timber-to-timber and panel-to-timber connections 8.2.3 Steel-to-timber connections 8.3 NAILED CONNECTIONS 8.3.1 Laterally loaded nails 8.3.1 General 8.3.1.2 Nailed timber-to-timber connections 8.3.1.3 Nailed panel-to-timber connections 8.3.1.4 Nailed steel-to-timber connections 8.3.2 Axially loaded nails 8.3.3 Combined laterally and axially loaded nails 8.4 STAPLED CONNECTIONS 8.5 BOLTED CONNECTIONS 8.5.1 Laterally loaded bolts 8.5.1.1 General and bolted timber-to-timber connections 	58 60 62 62 64 67 67 67 67 69 69 71 71 71 71
 8.5.1.3 Bolted steel-to-timber connections 8.5.2 Axially loaded bolts 8.6 DOWELLED CONNECTIONS 8.7 SCREWED CONNECTIONS 	73 73 73 74
 8.7.1 Laterally loaded screws 8.7.2 Axially loaded screws 8.7.3 Combined laterally and axially loaded screws 8.8 CONNECTIONS MADE WITH PUNCHED METAL PLATE FASTENERS 	74 74 77 77
 8.8.1 General 8.8.2 Plate geometry 8.8.3 Plate strength properties 8.8.4 Plate anchorage strengths 8.8.5 Connection strength verification 8.8.5.1 Plate anchorage capacity 8.8.5.2 Plate capacity 8.8.5.2 Plate capacity 8.9 SPLIT RING AND SHEAR PLATE CONNECTORS 	77 77 78 79 79 79 81 82
8.10 TOOTHED-PLATE CONNECTORS SECTION 9 COMPONENTS AND ASSEMBLIES	85 88
9.1 COMPONENTS 9.1.1 Glued thin-webbed beams 9.1.2 Glued thin-flanged beams 9.1.3 Mechanically jointed beams 9.1.4 Mechanically jointed and glued columns	88 88 90 91 92 92
 9.2.1 Trusses 9.2.1 Trusses with punched metal plate fasteners 9.2.2 Trusses with punched metal plate fasteners 9.2.3 Roof and floor diaphragms 9.2.3.1 General 9.2.3.2 Simplified analysis of roof and floor diaphragms. 9.2.4 Wall diaphragms 9.2.4.1 General 9.2.4.2 Simplified analysis of wall diaphragms – Method A 9.2.4.3 Simplified analysis of wall diaphragms – Method B 9.2.4.3.1 Construction of walls and panels to meet the requirements of the simplified analysis 9.2.4.3.2 Design procedure 9.2.5 Bracing 9.2.5.1 General 9.2.5.2 Single members in compression 	92 93 94 94 95 95 95 98 98 99 101 101 101
 9.2.1 Trusses 9.2.2 Trusses with punched metal plate fasteners 9.2.3 Roof and floor diaphragms 9.2.3.1 General 9.2.3.2 Simplified analysis of roof and floor diaphragms. 9.2.4 Wall diaphragms 9.2.4.1 General 9.2.4.2 Simplified analysis of wall diaphragms – Method A 9.2.4.3 Simplified analysis of wall diaphragms – Method B 9.2.4.3.1 Construction of walls and panels to meet the requirements of the simplified analysis 9.2.4.3.2 Design procedure 9.2.5 Bracing 9.2.5.1 General 	93 94 94 95 95 95 98 98 98 99 101

	D JOINTS	104
	ECTIONS WITH MECHANICAL FASTENERS	104
-	General	104
10.4.2	Nails	104
10.4.3	Bolts and washers	104
10.4.4	Dowels	105
10.4.5	Screws	105
10.5 Asse	MBLY	105
10.6 Tran	SPORTATION AND ERECTION	105
10.7 CONT	ROL	106
10.8 SPEC	IAL RULES FOR DIAPHRAGM STRUCTURES	106
	Floor and roof diaphragms	106
	Wall diaphragms	107
	IAL RULES FOR TRUSSES WITH PUNCHED METAL PLATE FASTENERS	107
	Fabrication	107
10.9.2		107
		101
ANNEX A (info	rmative) BLOCK SHEAR AND PLUG SHEAR FAILURE AT MULTIPLE	
DOWEL-TYPE	STEEL-TO-TIMBER CONNECTIONS	109
ANNEX B (info	rmative) MECHANICALLY JOINTED BEAMS	111
B.1 SIMPI	LIFIED ANALYSIS	111
B.1.1	Cross-sections	111
B.1.2	Assumptions	111
B.1.3	Spacings	111
	Deflections resulting from bending moments	111
	CTIVE BENDING STIFFNESS	113
	AL STRESSES	113
	MUM SHEAR STRESS	113
	ENER LOAD	113
B.5 FAST	ENER LOAD	115
ANNEX C (info	rmative) BUILT-UP COLUMNS	115
C.1 GENE	RAL	115
C 1 1	Assumptions	115
	Load-carrying capacity	115
C.2 MECH	ANICALLY JOINTED COLUMNS	115
	Effective slenderness ratio	115
	Load on fasteners	115
	Combined loads	116
	ED COLUMNS WITH PACKS OR GUSSETS	116
	Assumptions	116
	•	
	Axial load-carrying capacity	117
	Load on fasteners, gussets or packs	118
	CE COLUMNS WITH GLUED OR NAILED JOINTS	118
	Assumptions	118
	Load-carrying capacity	119
C.4.3	Shear forces	121
ANNEX D (info	rmative) BIBLIOGRAPHY	122

Foreword

This European Standard EN 1995-1-1 has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the Secretariat of which is held by BSI.

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 May 2005, and conflicting national standards shall be withdrawn at the latest by March 2010.

This European Standard supersedes ENV 1995-1-1:1993.

CEN/TC250 is responsible for all Structural Eurocodes.

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

A Foreword to EN 1995-1-1:2004/A1:2008

This document (EN 1995-1-1:2004/A1:2008) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the secretariat of which is held by BSI.

This Amendment to the European Standard EN 1995-1-1:2004 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2008, and conflicting national standards shall be withdrawn at the latest by March 2010.

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.

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 United Kingdom.