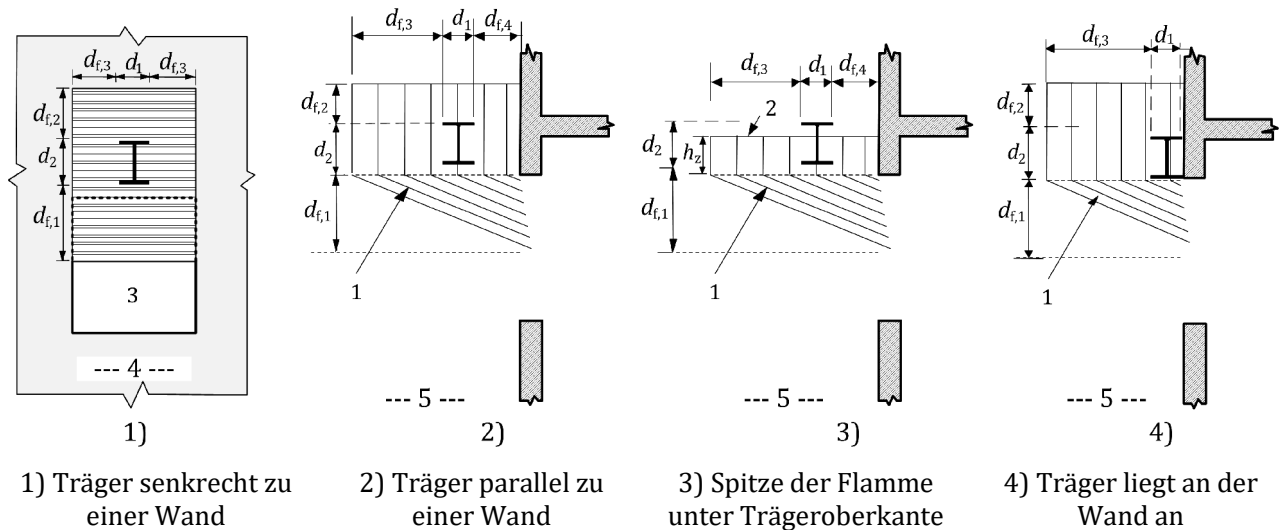
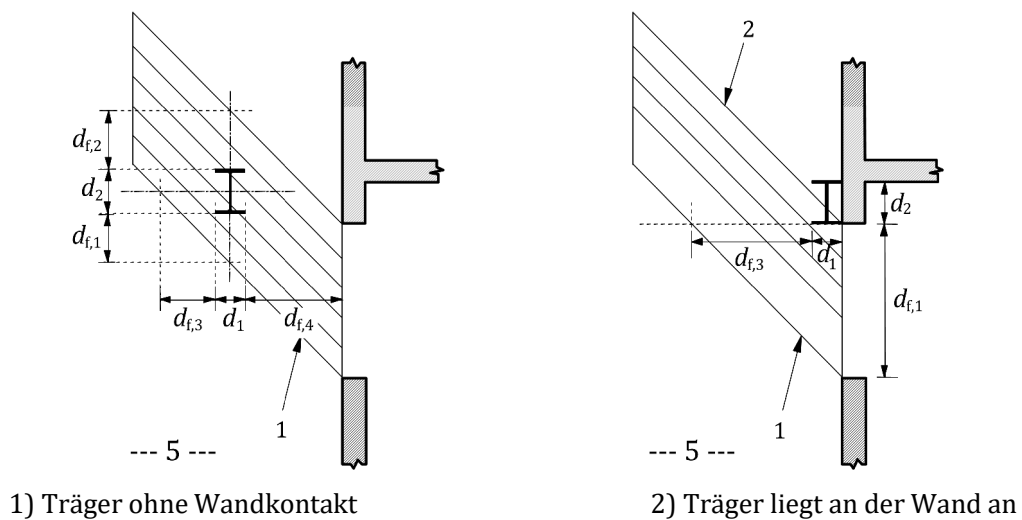




a) Ohne Zwangsbe- und Entlüftung



b) Mit Zwangsbe- und Entlüftung

Legende

- 1 Flamme
- 2 Flammenoberseite
- 3 Öffnung
- 4 Ansicht
- 5 Schnitt

Bild B.7 — Beflammter Träger

(4) Liegt die Spitze der Flamme unterhalb der Trägeroberkante, sollten Gleichung (B.35), Gleichung (B.36), Gleichung (B.37) und Gleichung (B.38) angewendet werden:

$$I_{z,1} = C_1 \varepsilon_{z,1} \sigma T_o^4 \quad (B.35)$$

$$I_{z,2} = 0 \quad (B.36)$$

$$I_{z,3} = (h_z/d_2) C_3 \varepsilon_{z,3} \sigma (T_{z,1}^4 + T_x^4)/2 \quad (B.37)$$

$$I_{z,4} = (h_z/d_2) C_4 \varepsilon_{z,4} \sigma (T_{z,1}^4 + T_x^4)/2 \quad (B.38)$$

Dabei ist

T_x die Flammentemperatur an der Flammenspitze [813 K];

h_z die Höhe der Flammenspitze über der Trägerunterkante.

B.7.1.3 Mit Zwangsbe- und Entlüftung

(1) Im Fall „mit Zwangsbe- und Entlüftung“ sollte bei parallel zur Außenwand des Brandabschnitts liegenden Trägern zwischen an der Wand anliegenden und nicht anliegenden Trägern unterschieden werden.

ANMERKUNG Erläuterungen dazu gibt Bild B.7.

(2) Für parallel liegende aber nicht an der Außenwand anliegende Träger oder senkrecht zur Außenwand liegende Träger sollten Gleichung (B.39), Gleichung (B.40), Gleichung (B.41) und Gleichung (B.42) angewendet werden:

$$I_{z,1} = C_1 \varepsilon_{z,1} \sigma T_0^4 \quad (B.39)$$

$$I_{z,2} = C_2 \varepsilon_{z,2} \sigma T_{z,2}^4 \quad (B.40)$$

$$I_{z,3} = C_3 \varepsilon_{z,3} \sigma (T_{z,1}^4 + T_{z,2}^4) / 2 \quad (B.41)$$

$$I_{z,4} = C_4 \varepsilon_{z,4} \sigma (T_{z,1}^4 + T_{z,2}^4) / 2 \quad (B.42)$$

(3) Liegt der Träger parallel zur Außenwand und direkt an ihr an, sollte nur die Trägerunterseite als direkt den Flammen ausgesetzt betrachtet werden, aber eine Seitenfläche und die Oberseite des Trägers sollten als durch die Wärmestrahlung der Flammenoberseite betroffen betrachtet werden, siehe Bild B.7 (b) (2). Daher gelten Gleichung (B.43), Gleichung (B.44), Gleichung (B.45) und Gleichung (B.46):

$$I_{z,1} = C_1 \varepsilon_{z,1} \sigma T_0^4 \quad (B.43)$$

$$I_{z,2} = \phi_{z,2} C_2 \varepsilon_{z,2} \sigma T_{z,2}^4 \quad (B.44)$$

$$I_{z,3} = \phi_{z,3} C_3 \varepsilon_{z,3} \sigma (T_{z,1}^4 + T_{z,2}^4) / 2 \quad (B.45)$$

$$I_{z,4} = 0 \quad (B.46)$$

Dabei ist

$\phi_{z,i}$ der Konfigurationsfaktor der Flammenoberseite bezüglich der Seite i des Trägers nach prEN 1991-1-2:20XX, Anhang G.

B.7.2 Emissionswert der Flammen

(1) Der Emissionswert der Flamme $\varepsilon_{z,i}$ für jede Seite 1, 2, 3 und 4 des Trägers sollte mit der Gleichung für ε nach prEN 1991-1-2:20XX, Anhang B bestimmt werden, unter Verwendung einer Flammendicke d_f mit der Dimension $d_{f,i}$ nach Bild B.7 für die jeweilige Trägerseite i .

B.7.3 Absorptionswert der Flamme

(1) Der Absorptionswert der Flamme a_z sollte nach Gleichung (B.47) berechnet werden:

$$a_z = 1 - e^{0,3 h_{eq}} \quad (B.47)$$

Dabei ist

h_{eq} die Höhe der Öffnung (siehe Bild B.7b) (die Höhe wird mit $d_{f,1}$ bezeichnet).

Literaturhinweise

Diese Literaturhinweise sind in zwei Abschnitte unterteilt:

- in Empfehlungen enthaltene Verweisungen („sollte“-Sätze),
- als Information enthaltene Verweisungen (z. B. „kann“-Sätze)

In Empfehlungen enthaltene Verweisungen (d. h. durch „sollte“-Sätze)

Die folgenden Dokumente werden im Text in solcher Weise in Bezug genommen, dass einige Teile davon oder ihr gesamter Inhalt keine streng einzuhaltenden Anforderungen, sondern nachdrücklich empfohlene Entscheidungen oder Verfahrensweisen darstellen. In Abhängigkeit von nationalen Regeln und/oder relevanten Vertragsbestimmungen könnten alternative Normen angewendet/angenommen werden, wenn sie technisch verifiziert sind. Bei datierten Verweisungen gilt nur die in Bezug genommene Ausgabe. Bei undatierten Verweisungen gilt die letzte Ausgabe des in Bezug genommenen Dokuments (einschließlich aller Änderungen).

- [1] EN 13381-1, *Prüfverfahren zur Bestimmung des Beitrages zum Feuerwiderstand von tragenden Bauteilen — Teil 1: Horizontal angeordnete Brandschutzbekleidungen*
- [2] EN 13381-2, *Prüfverfahren zur Bestimmung des Beitrages zum Feuerwiderstand von tragenden Bauteilen — Teil 2: Vertikal angeordnete Brandschutzbekleidungen*
- [3] WI 0027357, *Protection of aluminium systems*
- [4] EN 13501-2, *Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten — Teil 2: Klassifizierung mit den Ergebnissen aus den Feuerwiderstandsprüfungen, mit Ausnahme von Lüftungsanlagen*

Als Information enthaltene Verweisungen (z. B. durch „kann“-Sätze)

- [5] EN 485-2, *Aluminium und Aluminiumlegierungen — Bänder, Bleche und Platten — Teil 2: Mechanische Eigenschaften*
- [6] EN 755-2, *Aluminium und Aluminiumlegierungen — Stranggepresste Stangen, Rohre und Profile — Teil 2: Mechanische Eigenschaften*
- [7] EN 1090-3, *Ausführung von Stahltragwerken und Aluminiumtragwerken — Teil 3: Technische Regeln für die Ausführung von Aluminiumtragwerken*

– *Entwurf* –

- Entwurf -

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 1999-1-2

March 2021

ICS 13.220.50; 91.010.30; 91.080.17

Will supersede EN 1999-1-2:2007

English Version

Eurocode 9 - Design of aluminium structures - Part 1-2: Structural fire design

Eurocode 9 - Calcul des structures en aluminium -
Partie 1-2: Calcul du comportement au feu

Eurocode 9: Bemessung und Konstruktion von
Aluminiumtragwerken - Teil 1-1: Allgemeine
Bemessungsregeln

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 250.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword.....	4
Introduction	5
1 Scope	7
1.1 Scope of EN 1999-1-2	7
1.2 Assumptions.....	7
2 Normative references.....	8
3 Terms, definitions and symbols.....	8
3.1 Terms and definitions	8
3.2 Symbols and abbreviations	9
4 Basis of design	13
4.1 General.....	13
4.2 Nominal fire exposure	13
4.3 Physically based fire exposure.....	13
4.4 Actions.....	13
4.5 Design values of material properties.....	13
4.6 Verification methods	14
4.7 Structural analysis.....	14
4.7.1 General.....	14
4.7.2 Member analysis	14
4.7.3 Analysis of part of the structure	15
4.7.4 Global structural analysis	15
5 Material properties	15
5.1 General.....	15
5.2 Thermal properties	16
5.2.1 Aluminium alloys	16
5.2.2 Fire protection materials	18
5.3 Mechanical properties of aluminium alloys.....	18
5.3.1 Strength and deformation properties	18
5.3.2 Unit mass.....	21
6 Tabulated design data	21
7 Simplified design methods	22
7.1 General.....	22
7.2 Resistance	23
7.2.1 Classification of cross-sections	23
7.2.2 Tension members	23
7.2.3 Beams	23
7.2.4 Columns	25
7.3 Aluminium temperature development.....	26
7.3.1 Unprotected interior aluminium members.....	26
7.3.2 Interior aluminium structures insulated by fire protection material.....	29
7.3.3 Interior aluminium structures in a void that is protected by heat screens.....	30
7.3.4 Exterior aluminium structures	31
8 Advanced design methods	32
8.1 General.....	32

8.2	Thermal analysis	32
8.3	Mechanical analysis	32
8.4	Validation of advanced design methods.....	33
Annex A (informative) Properties of aluminium alloys and/or tempers not listed in EN 1999-1-1.....		
		34
A.1	Use of this Informative Annex.....	34
A.2	Scope and field of application	34
Annex B (informative) Heat transfer to external structural aluminium members		35
B.1	Use of this Informative Annex.....	35
B.2	Scope and field of application	35
B.3	General rules	35
B.4	Column not engulfed in flame	38
B.5	Beam not engulfed in flame	44
B.6	Column engulfed in flame.....	47
B.7	Beam fully or partially engulfed in flame	49
Bibliography		53

European foreword

This document (prEN 1999-1-2:2021) has been prepared by Technical Committee CEN/TC250 "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 document will supersede EN 1999-1-2:2007.

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.

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
- <New parts>

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 most appropriately 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 1999 Eurocode 9

EN 1999 applies to the design of buildings and civil engineering and structural works made of aluminium. It complies with the principles and requirements for the safety and serviceability of structures, the basis of their design and verification that are given in EN 1990 – Basis of structural design.

EN 1999 is only concerned with requirements for resistance, serviceability, durability and fire resistance of aluminium structures. Other requirements, e.g. concerning thermal or sound insulation, are not considered.

EN 1999 does not cover the special requirements of seismic design. Provisions related to such requirements are given in EN 1998, which complements, and is consistent with EN 1999.

EN 1999 is subdivided in five parts:

- EN 1999-1-1 Design of Aluminium Structures: General structural rules.
- EN 1999-1-2 Design of Aluminium Structures: Structural fire design.
- EN 1999-1-3 Design of Aluminium Structures: Structures susceptible to fatigue.

- EN 1999-1-4 Design of Aluminium Structures: Cold-formed structural sheeting.
- EN 1999-1-5 Design of Aluminium Structures: Shell structures.

0.3 Introduction to EN 1999-1-2

This document describes the principles, requirements and rules for the structural design of aluminium buildings exposed to fire. The focus in EN 1999-1-2 is on design methods and design rules for individual members (beams, columns, beam-columns), joints and skeletal structures (frames) regarding resistance and stability under fire conditions.

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 prEN 1999-1-2

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

The national standard implementing EN 1999-1-2 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 standard is to be used.

When no national choice is made and no default is given in this standard, 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 1999-1-2 through the following clauses:

4.5(1) NOTE

4.7(1) NOTE

7.2.1 (1) NOTE

7.2.3 (5) NOTE

7.2.4 (4) NOTE

National choice is allowed in EN 1999-1-2 on the application of the following informative annexes:

Annex A (informative) Properties of aluminium alloys and/or tempers not listed in EN 1999-1-1

Annex B (informative) Heat transfer to external structural aluminium members

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.