



SLOVENSKI STANDARD
oSIST prEN 1994-1-2:2024
01-junij-2024

**Evrokod 4 - Projektiranje sovprežnih konstrukcij iz jekla in betona – 1-2. del:
Požarnoodporno projektiranje**

Eurocode 4 - Design of composite steel and concrete structures - Part 1-2: Structural fire design

Eurocode 4 - Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 1-2: Tragwerksbemessung für den Brandfall

Eurocode 4 - Calcul des structures mixtes acier-béton - Partie 1-2 : Calcul du comportement au feu

Ta slovenski standard je istoveten z: prEN 1994-1-2

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ICS:

13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
91.010.30	Tehnični vidiki	Technical aspects
91.080.13	Jeklene konstrukcije	Steel structures
91.080.40	Betonske konstrukcije	Concrete structures

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English Version

Eurocode 4 - Design of composite steel and concrete structures - Part 1-2: Structural fire design

Eurocode 4 ζ Calcul des structures mixtes acier-béton ζ
Partie 1-2 : Calcul du comportement au feu

Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 1-2: Allgemeine Regeln Tragwerksbemessung für den Brandfall

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

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prEN 1994-1-2:2024 (E)**European foreword**

This document (prEN 1994-1-2:2024) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 1994-1-2:2000 and its amendments and corrigenda.

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.

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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
- New parts are under development, e.g. Eurocode for design of structural glass

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 1994 (all parts)

EN 1994 applies to the design of steel and concrete composite structures in buildings and civil engineering works. 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 and geotechnical design*.

EN 1994 is concerned only with the requirements for resistance, serviceability, durability and fire resistance of steel structures. Other requirements, e.g. concerning thermal or sound insulation, are not covered.

EN 1994 is subdivided in various parts:

EN 1994-1-1, *Eurocode 4 — Design of composite steel and concrete structures — Part 1-1: General rules and rules for buildings*;

EN 1994-1-2, *Eurocode 4 — Design of composite steel and concrete structures — Part 1-2: Structural fire design*;

EN 1994-2, *Eurocode 4 — Design of composite steel and concrete structures — Part 2: Bridges*.

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0.3 Introduction to prEN 1994-1-2

prEN 1994-1-2 describes the principles, requirements and rules for the structural design of steel and concrete composite buildings exposed to fire.

prEN 1994-1-2 is intended for clients (e.g. for the formulation of their specific requirements), designers, contractors and relevant authorities.

The general objectives of fire protection are to limit risks with respect to the individual and society, neighbouring property and where required, environment or directly exposed property, in the case of fire.

The parts of the Structural Eurocodes relating to fire deal with specific aspects of passive fire protection in terms of designing structures and parts for adequate loadbearing resistance and for limiting fire spread as relevant.

Required functions and levels of performance can be specified either in terms of nominal (standard) fire resistance rating, generally given in national fire regulations or by referring to fire safety engineering for assessing passive and active measures, see EN 1991-1-2.

Supplementary requirements concerning, e.g.:

- the possible installation and maintenance of sprinkler systems;
- conditions on occupancy of building or fire compartment; and
- the use of approved insulation and coating materials, including their maintenance

are not given in this standard because they are subject to specification by the competent authority.

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 1994-1-2

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 prEN 1994-1-2 can have a National Annex containing all national choices that relate to the design of buildings and civil engineering works 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 the relevant parties.

National choice is allowed in prEN 1994-1-2 through notes to the following clauses:

4.5(1)

4.7(2)

G.2(1)

National choice is allowed in prEN 1994-1-2 on the application of the following informative annex:

Annex B

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.

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prEN 1994-1-2:2024 (E)**1 Scope****1.1 Scope of prEN 1994-1-2**

(1) prEN 1994-1-2 gives rules for the design of steel-concrete composite structures for the accidental design situation of fire exposure. It only identifies differences from, or supplements to, rules for normal temperature design.

(2) prEN 1994-1-2 only applies to structures, or parts of structures, that are within the scope of EN 1994-1-1 and are designed accordingly.

1.2 Assumptions

(1) The assumptions of EN 1990 apply, along with the following:

- The choice of the relevant design fire scenario is made by appropriate qualified and experienced personnel or is given by the relevant national regulation;
- Any fire protection measure taken into account in the design will be adequately maintained.

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 dates references, only the edition cited applies. For undated references, the latest edition of the referenced document (including 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. in 'should' clauses), permissions ('may' clauses), possibilities ('can' clauses), and in notes.

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

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

FprEN 1991-1-2:2023, *Eurocode 1 — Actions on structures — Part 1-2: Actions on structures exposed to fire*

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 1993-1-1:2022, *Eurocode 3 — Design of steel structures — Part 1-1: General rules and rules for buildings*

prEN 1994-1-1:2024, *Eurocode 4 — Design of composite steel and concrete structures — Part 1-1: General rules and rules for buildings*

3 Terms, definitions and symbols**3.1 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 1990 and EN 1991-1-2 and the following apply.

3.1.1**axis distance**

distance between the centre of the reinforcing bar and the nearest edge of concrete

3.1.2

critical temperature of reinforcement

temperature of reinforcement at which loadbearing failure of the element is expected to occur at a given stress

3.1.3

critical temperature of structural steel element

temperature for a given load level, at which failure is expected to occur in a structural steel element assuming a uniform temperature distribution

3.1.4

effective cross-section

cross-section of the member in structural fire design used in the effective cross-section method

Note 1 to entry: It is obtained by removing parts of the cross-section with assumed zero strength and stiffness.

3.1.5

failure time of fire protection system

duration of protection of member against direct fire exposure (e.g. when the fire protective sheathing or other protection fall off the composite member, or when a structural member initially protecting the member fails due to collapse, or when the protection from another structural member is no longer effective due to excessive deformation)

3.1.6

fire protection material

any material or combination of materials applied to a structural member for the purpose of increasing its fire resistance

3.1.7

maximum stress level

for a given temperature, the stress level at which the stress-strain relationship of steel is truncated to provide a yield plateau

3.1.8

part of structure

isolated part of a structure with appropriate support and boundary conditions

3.1.9

protected members

members for which measures are taken to reduce the temperature rise in the member due to fire

3.1.10

section factor

for a steel member, the ratio between the exposed surface area and the volume of steel; for an enclosed member, the ratio between the internal surface area of the exposed encasement and the volume of steel

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3.2 Symbols and abbreviations

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

3.2.1 Symbols

3.2.1.1 Latin upper-case letters

Symbol	Definition
A	cross-sectional area
A_c	cross-sectional area of concrete part
A_f	cross-sectional area of a steel flange
A_i	area of part i of the cross-section or exposed surface area of part i of the steel cross-section per unit length
$A_{i,\theta}$	Reduced area of part i of the cross-section at temperature θ
A_i / V_i	section factor of part i of the steel cross-section (non-protected member)
A_p	area of the inner surface of the fire protection material per unit length of the steel beam
A_p / V	section factor of the steel cross-section with box protection
$A_{p,i}$	area of the inner surface of the fire protection material per unit length of part i of the steel member
$A_{p,i} / V_i$	section factor of part i of the steel cross-section
A_s	cross-sectional area of the reinforcing bars
E	integrity criterion
E_a	characteristic value for the modulus of elasticity of structural steel at 20 °C
$E_{a,\theta}$	characteristic value for the slope of the linear elastic range of the stress-strain relationship of structural steel at elevated temperatures
$E_{c,sec,\theta}$	characteristic value for the secant modulus of concrete in the fire situation, given by $f_{c,\theta}$ divided by $\varepsilon_{cu,\theta}$
E_d	design effect of actions for normal temperature design
$E_{d,fi}$	design effect of actions in the fire situation, assumed to be time independent
$(EI)_{eff,fi}$	effective flexural stiffness in the fire situation
E_k	characteristic value for the modulus of elasticity at 20 °C
E_s	characteristic value for the modulus of elasticity of modulus of elasticity of reinforcing bars at 20 °C