SLOVENSKI STANDARD
SIST EN 1991-1-2:2024

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Nadomešča:
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Evrokod 1 - Vplivi na konstrukcije - 1-2. del: Vplivi požara na konstrukcije

Eurocode 1 - Actions on structures – Part 1-2: Actions on structures exposed to fire

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 1-2: Einwirkungen im Brandfall

Eurocode 1 - Actions sur les structures - Partie 1-2: Actions sur les structures exposées au feu

Ta slovenski standard je istoveten z: **EN 1991-1-2:2024**

ICS:

13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
91.010.30	Tehnični vidiki	Technical aspects

SIST EN 1991-1-2:2024 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1991-1-2

March 2024

ICS 13.220.50; 91.010.30

Supersedes EN 1991-1-2:2002

English Version

Eurocode 1 - Actions on structures - Part 1-2: Actions on structures exposed to fire

Eurocode 1 - Actions sur les structures - Partie 1-2: Actions sur les structures exposées au feu

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 1-2: Allgemeine Einwirkungen - Brandeinwirkungen auf Tragwerke

This European Standard was approved by CEN on 1 January 2024.

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 CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

European foreword

This document (EN 1991-1-2:2024) 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 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 September 2027, and conflicting national standards shall be withdrawn at the latest by March 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 1991-1-2:2002.

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.

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.

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 structure*

— 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 Eurocodes 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 1991

EN 1991 (all parts) specifies actions for the structural design of buildings, bridges and other civil engineering works, or parts thereof, including temporary structures, in conjunction with EN 1990 and the other Eurocodes.

EN 1991 does not cover the specific requirements of actions for seismic design. Provisions related to such requirements are given in EN 1998 (all parts), which complement and are consistent with EN 1991.

EN 1991 is also applicable to existing structures for their:

— structural assessment,

— strengthening or repair,

— change of use.

NOTE 1 In these cases, additional or amended provisions can be necessary.

EN 1991 is also applicable for the design of structures where materials or actions outside the scope of the other Eurocodes are involved.

NOTE 2 In this case, additional or amended provisions can be necessary.

EN 1991 is subdivided in various parts:

EN 1991-1-1, *Eurocode 1 — Actions on structures — Part 1-1: Specific weight of materials, self-weight of construction works and imposed loads for buildings*

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

EN 1991-1-3, *Eurocode 1 — Actions on structures — Part 1-3: Snow Loads*

EN 1991-1-4, *Eurocode 1 — Actions on structures — Part 1-4: Wind Actions*

EN 1991-1-5, *Eurocode 1 — Actions on structures — Part 1-5: Thermal Actions*

EN 1991-1-6, *Eurocode 1 — Actions on structures — Part 1-6: Actions during execution*

EN 1991-1-7, *Eurocode 1 — Actions on structures — Part 1-7: Accidental actions*

EN 1991-1-8, *Eurocode 1 — Actions on structures — Part 1-8: Actions from waves and currents on coastal structures*

EN 1991-1-9, *Eurocode 1 — Actions on structures — Part 1-9: Atmospheric icing*

EN 1991-2, *Eurocode 1 — Actions on structures — Part 2: Traffic loads on bridges and other civil engineering works*

EN 1991-3, *Eurocode 1 — Actions on structures — Part 3: Actions induced by cranes and machines*

EN 1991-4, *Eurocode 1 — Actions on structures — Part 4: Silos and tanks*

0.3 Introduction to EN 1991-1-2

EN 1991-1-2 describes the thermal and mechanical actions for the structural design of buildings exposed to fire, including the following safety requirements and design procedures.

EN 1991-1-2 is intended to be used with EN 1990, the other Parts of EN 1991 and EN 1992 to EN 1999 for the design of structures.

0.3.1 Safety requirements

The general objectives 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.

Construction Products Regulation (EU) No 305/2011 gives the following requirement for the limitation of the consequence in case of fire:

“The construction works must be designed and built in such a way, that in the event of an outbreak of fire

— the load bearing capacity of the construction can be assumed for a specified period of time,

— the generation and spread of fire and smoke within the works are limited,

— the spread of fire to neighbouring construction works is limited,

— the occupants can leave the works or can be rescued by other means,

— the safety of rescue teams is taken into consideration”.

According to the Interpretative Document N°2 “Safety in Case of Fire”[1)] the essential requirement may be observed by following various possibilities for fire safety strategies prevailing in the Member States like

1) See 2.2, 3.2(4) and 4.2.3.3 of ID N°2.

conventional fire scenarios (nominal fires) or “natural” (physically based) fire scenarios, including passive and/or active fire protection measures.

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, where allowed by national fire regulations, by referring to fire safety engineering for assessing passive and active measures.

The fire parts of Structural Eurocodes deal with specific aspects of passive fire protection in terms of designing structures and parts thereof for adequate load bearing resistance and for limiting fire spread as relevant.

Numerical values for partial factors and other reliability elements are given to provide an acceptable level of reliability. They have been selected assuming that an appropriate level of workmanship and of quality management applies.

0.3.2 Design procedures

A full analytical procedure for structural fire design would take into account the behaviour of the structural system at elevated temperatures, the potential heat exposure and the beneficial effects of active and passive fire protection systems, together with the uncertainties associated with these three features and the importance of the structure (consequences of failure).

At the present time, it is possible to undertake a procedure for determining adequate performance which incorporates some, if not all, of the above parameters and to demonstrate that the structure, or its components, will give adequate performance in a real building fire. However, where the procedure is based on a nominal (standard) fire, the classification system, which calls for specific periods of fire resistance, takes into account (though not explicitly) the features and uncertainties described above.

Figure 1 illustrates the two design procedures provided by EN 1991-1-2, i.e. the prescriptive approach and the performance-based approach. The prescriptive approach uses nominal (standard) fires to generate thermal actions. The performance-based approach, using fire safety engineering, refers to thermal actions based on physical and chemical parameters.

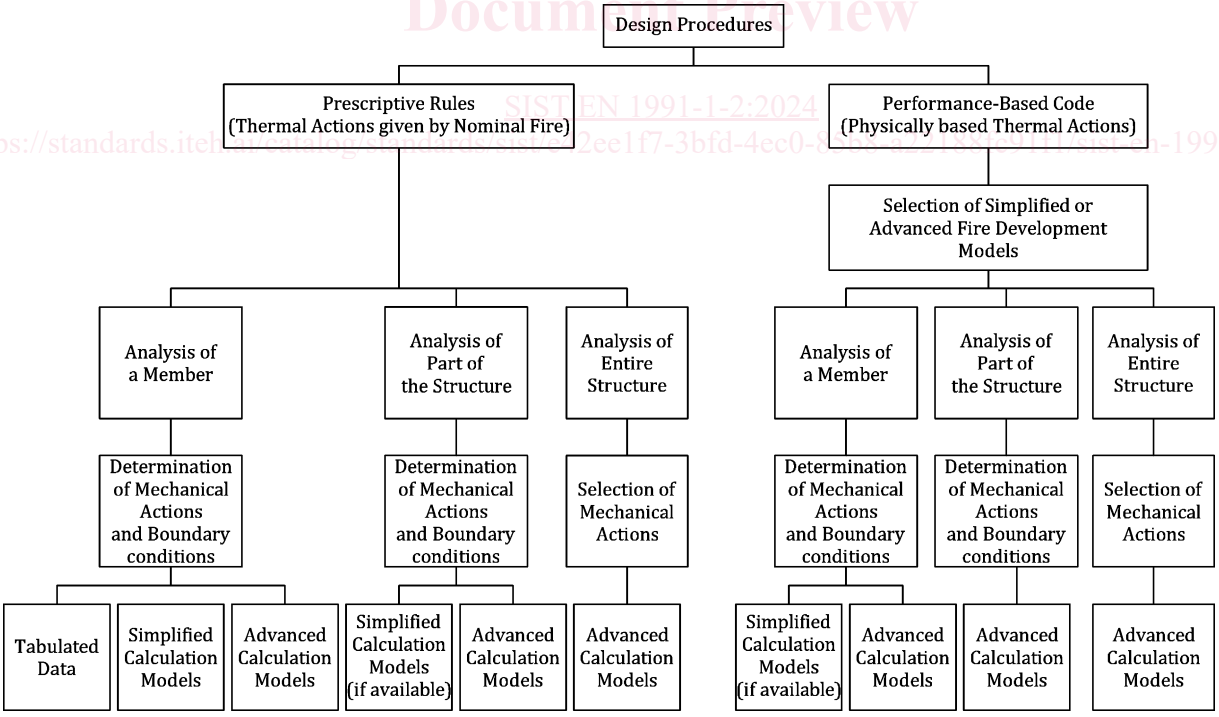

Figure 1 — Alternative design procedures

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 1991-1-2

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 1991-1-2 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 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 1991-1-2 through notes to the following clauses:

4.4(4) NOTE	6.2.2(2)	6.3.1(2)	H.3(4)

National choice is allowed in EN 1991-1-2 on the application of the following informative annexes:

Annex A	Annex B	Annex C	Annex D
Annex E	Annex F	Annex G	Annex H

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 1991-1-2

(1) The methods given in this Eurocode are applicable to buildings and civil engineering works, with a fire load related to the building and its occupancy.

(2) EN 1991-1-2 deals with thermal and mechanical actions on structures exposed to fire. It is intended to be used in conjunction with the fire design Parts of EN 1992 to EN 1996 and EN 1999 which give rules for designing structures for fire resistance.

(3) EN 1991-1-2 contains thermal actions either nominal or physically based. More data and models for physically based thermal actions are given in annexes.

(4) EN 1991-1-2 does not cover the assessment of the damage of a structure after a fire.

(5) EN 1991-1-2 does not cover supplementary requirements concerning, for example:

— the possible installation and maintenance of sprinkler systems;

— conditions on occupancy of building or fire compartment;

— the use of approved insulation and coating materials, including their maintenance.

1.2 Assumptions

(1) In addition to the general assumptions of EN 1990 the following assumptions apply:

— 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 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. in 'should' clauses), permissions ('may' clauses), possibilities ('can' clauses), and in notes.

EN 1990:2023, *Eurocode — Basis of structural and Geotechnical design*

EN 1992 (all parts), *Eurocode 2 — Design of concrete structures*

EN 1996 (all parts), *Eurocode 6 — Design of masonry structures*

EN 1999 (all parts), *Eurocode 9 — Design of aluminium structures*

EN 1993-1-2:2024, *Eurocode 3 — Design of steel structures — Part 1-2: Structural fire design*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

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 the following apply.

3.1.1 Common terms used in Eurocode Fire parts

3.1.1.1
equivalent time of fire exposure
time of exposure to the standard fire curve supposed to have the same heating effect as a real fire in the compartment

3.1.1.2
external member
structural member located outside the building that can be exposed to fire through openings in the building enclosure

3.1.1.3
compartment, fire compartment
space within a building, extending over one or several floors, which is enclosed by separating elements such that fire spread beyond the compartment is prevented during the relevant fire exposure

3.1.1.4
fire resistance
ability of a structure, a part of a structure or a member to fulfil its required functions (load bearing function and/or fire separating function) for a specified load level, for a specified fire exposure and for a specified period of time

3.1.1.5
fully developed fire
state of full involvement of all combustible surfaces in a fire within a specified space

3.1.1.6
global structural analysis (for fire)
structural analysis of the entire structure, when either the entire structure, or only a part of it, are exposed to fire

Note 1 to entry: Indirect fire actions are considered throughout the structure.

3.1.1.7
indirect fire actions
internal forces and moments caused by thermal expansion

3.1.1.8
integrity
E
ability of a separating element of building construction, when exposed to fire on one side, to prevent the passage through it of flames and hot gases and to prevent the occurrence of flames on the unexposed side

3.1.1.9
insulation
I
ability of a separating element of building construction when exposed to fire on one side, to restrict the temperature rise of the unexposed face below specified levels

3.1.1.10
load bearing function
R
ability of a structure or a member to sustain specified actions during the relevant fire, according to defined criteria

3.1.1.11
member
basic part of a structure (such as beam, column, but also assembly such as stud wall, truss) considered as isolated with appropriate boundary and support conditions

3.1.1.12
member analysis (for fire)
thermal and mechanical analysis of a structural member exposed to fire in which the member is assumed as isolated, with appropriate support and boundary conditions

Note 1 to entry: Indirect fire actions are not considered, except those resulting from thermal gradients.

3.1.1.13
normal temperature design
ultimate limit state design for ambient temperatures according to Part 1-1 of EN 1992 to EN 1996 or EN 1999

3.1.1.14
separating function
ability of a separating element to prevent fire spread (e.g. by passage of flames or hot gases — cf. integrity) or ignition beyond the exposed surface (cf. insulation) during the relevant fire

3.1.1.15
separating element
load bearing or non-load bearing element (e.g. wall) forming part of the enclosure of a fire compartment

3.1.1.16
standard fire resistance
ability of a structure or part of it (usually only members) to fulfil required functions (load-bearing function and/or separating function), for the exposure to heating according to the standard fire curve for a specified load combination and for a stated period of time

3.1.1.17
structural members
physically distinguishable part of a structure, e.g. column, beam, plate, foundation

3.1.1.18
temperature analysis
procedure of determining the temperature development in members based on the thermal actions (net heat flux) and the thermal material properties of the members and of protective surfaces, where relevant