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BSI Standards Publication

Eurocode 1 — Actions on structures

Part 2: Traffic loads on bridges and other civil engineering works

bsi.

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National foreword

This British Standard is the UK implementation of EN 1991-2:2023. It supersedes BS EN 1991-2:2003, which will be withdrawn on 30 March 2028.

The UK participation in its preparation was entrusted to Technical Committee B/525/10, Bridges.

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The first generation of EN Eurocodes was published between 2002 and 2007, with conflicting British Standards withdrawn in 2010.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UK adoptions of the first generation of EN Eurocodes will be withdrawn by BSI on 30 March 2028.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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Published by BSI Standards Limited 2023

ISBN 978 0 539 15657 7

ICS 91.010.30; 93.040

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2023.

Amendments/corrigenda issued since publication

Date	Text affected

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EUROPEAN STANDARD **EN 1991-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2023

ICS 91.010.30; 93.040

Supersedes EN 1991-2:2003

English Version

Eurocode 1 - Actions on structures - Part 2: Traffic loads on bridges and other civil engineering works

Eurocode 1 - Actions sur les structures - Partie 2: Actions dues au trafic sur les ponts et autres ouvrages du génie civil

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 2: Verkehrslasten auf Brücken

This European Standard was approved by CEN on 23 July 2023.

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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EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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Ref. No. EN 1991-2:2023 E

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European foreword

This document (EN 1991-2:2023) 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 1991-2:2003.

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.

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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 the EN 1991 (all parts)

EN 1991 specifies actions for the structural and geotechnical 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 regions. 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:

— structural assessment,

— strengthening or repair,

— changes of use.

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

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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 1991-2

EN 1991-2 gives design guidance and actions due to road, pedestrian and railway traffic on bridges and civil engineering works together with all relevant Eurocodes.

EN 1991-2 is addressed to all parties involved in construction activities (e.g. public authorities, clients, designers, contractors, producers, consultants, committees drafting standards for structural design and related product, testing and execution standards, etc.).

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

0.4 Additional information specific to EN 1991-2

EN 1991-2 defines models of traffic loads for the design of road bridges, footbridges and railway bridges. For the design of new bridges, EN 1991-2 is intended to be used, for direct application, together with the Eurocodes.

The basis for combinations of traffic loads with non-traffic loads are given in EN 1990:2023, A.2.

For road bridges, Load Models 1 and 2, defined in 6.3.2 and 6.3.3, and taken into account with adjustment factors α and β equal to 1, are deemed to represent the most severe traffic met or expected in practice, other than that of special vehicles requiring permits to travel, on the main routes of European countries.

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The traffic on other routes in these countries and in some other countries could be substantially lighter, or better controlled.

For railway bridges, Load Model 71 (together with Load Model SW/0 for continuous structural elements and decks), defined in 8.3.2, represent the static effect of standard rail traffic operating over the standard track gauge or wider than the standard track gauge European railway network. Load Model SW/2, defined in 8.3.3, represents the static effect of heavy rail traffic.

Provision is made for varying the specified loading to cater for variations in the type, volume and maximum weight of rail traffic on different railways, as well as for different qualities of track.

In addition two other load models are given for railway bridges:

— load model "unloaded train" for checking the lateral stability of bridges and

— load model HSLM to represent the loading from passenger trains at speeds exceeding 200 km/h.

Guidance is also given on aerodynamic actions on structures adjacent to railway tracks as a result of passing trains and on other actions from railway infrastructure.

Public authorities could also have responsibilities for the issue of regulations on authorized traffic (especially on vehicle loads) and for delivery and control dispensations when relevant, e.g. for special vehicles.

0.5 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.

0.6 National Annex for EN 1991-2

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 1991-2 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 relevant parties.

National choice is allowed in EN 1991-2 through notes to the following clauses:

4.3(1)	5.2(4)	6.1(1)	6.1(2)
6.2.1(1)	6.2.1(2)	6.2.3(1)	6.3.2(4)
6.3.2(9)	6.3.3(1)	6.3.3(4)	6.3.4(1)
6.3.5(1)	6.4.1(2)	6.4.1(4)	6.4.2(5)
6.5.1 – 2 choices	6.5.3(1)	6.6.1(2) – 2 choices	6.6.2(2)

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6.6.4(1)	6.6.4(2)	6.6.7(4)	6.6.8(2)
6.6.8(4)	6.6.8(5)	6.6.9(1)	6.7.1(2)
6.7.3.3(2)	6.7.3.3(3)	6.7.3.3(5) – 2 choices	6.7.3.3(6)
6.7.3.4(1)	6.8(2)	6.8(3)	6.8(5)
6.8(6)	6.9.1(1)	6.9.2(1) – 4 choices	6.9.3(1) – 2 choices
7.3.2(1)	7.3.3(1)	7.3.4(4)	7.4(1)
7.6.3(1)	8.1(3)	8.1(7) – 2 choices	8.3.2(4)
8.3.3(4)	8.3.6.4(5)	8.3.7(4)	8.4.4(1)
8.4.5.2(1)	8.4.5.4(1)	8.4.5.4(2) – 2 choices	8.4.6.1.1(2)
8.4.6.1.1(4)	8.4.6.1.1(5)	8.4.6.1.1(7)	8.4.6.1.2(3)
8.4.6.2(1)	8.4.6.2(2)	8.4.6.2(7)	8.4.6.2(8)
8.4.6.2(9)	8.4.6.3.1(3)	8.4.6.3.2(2)	8.4.6.3.3(4)
8.4.6.3.3(5)	8.4.6.5(4)	8.4.6.6(4)	8.4.6.6(6)
8.5.1(2)	8.5.1(8)	8.5.1(13)	8.5.3(6)
8.5.3(10)	8.5.3(11)	8.5.3(14)	8.5.4.1(5)
8.5.4.3(1)	8.5.4.3(2) – 2 choices	8.5.4.4(3)	8.5.4.4(6)
8.5.4.5	8.5.4.5.1(2)	8.5.4.5.1(3)	8.5.4.6.1(1)
8.5.4.6.3(1)	8.5.4.6.3(4)	8.6.1(4)	8.6.1(6)
8.7.2(2)	8.7.2(7)	8.7.2(8)	8.7.4(2)
8.8.1(1)	8.8.1(2)	8.8.1(7)	8.8.2(3)
8.8.3.1(1)	8.8.3.2(1)	8.8.4(1)	8.9(2)
8.9(3)	8.9(4)	8.10.1(1)	8.10.1(7)
8.10.2(1) – 3 choices	8.10.3(1) – 2 choices	8.10.3(2)	C.3(2) – 2 choices
D.4(2)	D.5(1)		

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

Annex A	Annex B	Annex E	Annex F
Annex G			

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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1 Scope

(1) This document defines imposed loads (models and representative values) associated with road traffic, pedestrian actions and rail traffic which include, when relevant, dynamic effects and centrifugal, braking and acceleration actions and actions for accidental design situations.

(2) The imposed loads defined in this document are applicable for the design of new bridges, including decks, piers, abutments and associated walls (e.g. upstand walls, wing walls and flank walls) and their foundations. These imposed loads can also be used for the design of other structures subject to traffic loads (e.g. road tunnel floor slabs, noise barriers and their foundations). Where appropriate, the loads can also be considered as a basis for assessment or modification of existing structures in combination with complementary conditions if necessary.

(3) The load models and values given in this document are also applicable for the design of retaining walls adjacent to roads and railway lines and the design of earthworks subject to road or rail traffic actions. This document also provides applicability conditions for specific load models.

(4) This document is intended to be used with EN 1990, the other parts of the EN 1991 series and the EN 1992 series to EN 1999 series for the design of structures.

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 1993 (all parts), *Eurocode 3 — Design of steel structures*

EN 1994 (all parts), *Eurocode 4 — Design of composite steel and concrete structures*

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

EN 1997-1:—[2], *Eurocode 7 — Geotechnical design - Part 1: General rules*

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

EN 15663, *Railway applications — Vehicle reference masses*

[1] Under preparation. Stage at the time of publication: prEN 1995-1-1:2023.
[2] Under preparation. Stage at the time of publication: prEN 1997-1:2022.