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Standards

Irish Standard
I.S. EN 1993-2:2006+NA:2010

Eurocode 3 - Design of steel structures - Part 2: Steel Bridges (Including Irish National Annex)

I.S. EN 1993-2:2006+NA:2010

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Eurocode 3 - Design of steel structures - Part 2: Steel Bridges

**Eurocode 3 - Calcul des structures en acier
- Partie 2: Ponts métalliques**

**Eurocode 3 - Bemessung und konstruktion
von Stahlbauten - Teil 2: Stahlbrücken**

This corrigendum becomes effective on 22 July 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 22 juillet 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 22.Juli 2009 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

1) Modification to "National annex for EN 1993-2"

2nd paragraph, list of national choice, replace "6.2.2.4(1)" with "6.2.2.5(1)".

2) Modification to 3.3.1.1

Paragraph "(1)", replace "2.8: Group 4" with "1.2.4: Group 4".

3) Modifications to 3.3.1.2

Paragraph "(1)", replace "2.8: Group 4" with "1.2.4: Group 4".

Paragraph "(1)", replace "2.8: Group 7" with "1.2.7: Group 7".

4) Modification to 3.3.1.3

Paragraph "(1)", replace "2.8: Group 6" with "1.2.6: Group 6".

5) Modifications to 3.3.1.4

Paragraph "(1)", replace "2.8: Group 1" with "1.2.1: Group 1".

Paragraph "(1)", replace "2.8: Group 4" with "1.2.4: Group 4".

6) Modification to 3.3.2

Paragraph "(1)", replace "2.8: Group 5" with "1.2.5: Group 5".

7) Modification to 5.2.1

Paragraph "(4)", replace "The bridges and components may be checked with first order theory if the following criterion is satisfied for each section:" with "Bridges may be checked with first order theory if the following criterion is satisfied:".

8) Modification to 6.2.2.6

Paragraph "(2)", replace "to class 3 section" with "to class 4 section".

9) Modification to 6.2.7.1

Paragraph "(2)", replace ", or of diaphragms" with ", and/or of diaphragms".

10) Modifications to 6.3.4.2

Paragraph "(2)", "NOTE 2", replace "chords and flanges" with "flanges and/or chords" and replace "or chords." with "and/or chords.".

Paragraph "(6)", replace "If the compression force N_{Ed} is" with "If the design value of the compression force N_{Ed} is".

Paragraph "(6)", replace "where N_E is the critical load" with "where N_E is the elastic critical load".

11)Modification to 7.4

Paragraph "(3)", replace " $\sigma_E = 190000 \left(\frac{t}{b} \right)^2$ " with " $\sigma_E = 190000 \left(\frac{t}{b_p} \right)^2$ ".

12)Modification to 8.2.5.2

Paragraph "(1)", replace the reference to "4.7.2(1), (2) and (3) of EN 1993-1-8" with "4.7.2(1) and (2) of EN 1993-1-8".

13)Modification to 8.2.8

Paragraph "(1)", replace the reference to "4.10(1), (2), (3), (4), (5) and (6) of EN 1993-1-8" with "4.10(1), (2), (3), (4) and (5) of EN 1993-1-8".

14)Modifications to 9.4.1

Paragraph "(4)", replace " $\Delta\sigma_{E2}$ " with " $\Delta\sigma_{E,2}$ ".

Paragraph "(6)", replace "fatigue stress spectra" with "stress-range spectra".

15)Modifications to 9.5.2

Paragraph "(1)", replace the reference to "(8)" with "(7)".

Paragraph "(2)", list entry "d", replace "for hangers, twice the length of hangers;" with "for hangers, twice the distance between hangers".

Paragraph "(7)", replace "fatigue stress spectra." with "stress-range spectrum".

16)Modification to 9.6

Paragraph "(2)", "Table 9.8", replace "Free edges of cope holes in webs of webs of crossbeams around soffits of stiffeners, see Figure 9.4" with "Free edges of cope holes in webs of crossbeams, see Figure 9.4".

17)Modification to A.1

Paragraph "(1)", replace in various places "vertical bearing capacity" with "vertical bearing resistance".

18)Modification to A.5.4

Paragraph "(3)", "NOTE", delete "Moments determined".

19)Modification to A.5.7

Paragraph "(1)", replace "variable rigidity" with "variable rigidity for compression".

20)Modification to B.2.2

Paragraph "(1)", list entry "4.", replace "including standard actions" with "including persistent actions".

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EN 1993-2:2006/AC:2009 (E)

21)Modification to C.1.1

Paragraph "(2)", "NOTE", replace "For technical information, see National Annex." with "The National Annex may give additional technical information."

22)Modification to C.1.3.5.4

Paragraph "(1)", replace "Figure C.11" with "Figure C.10".

23)Modification to D.1

Paragraph "(3)", replace "5.3.2(10) of EN 1993-1-1" with "5.3.2(11) of EN 1993-1-1".

24)Modifications to D.2.4

Paragraph "(2)", "Table D.3", Title, replace "for trusses without posts" with "for trusses".

Paragraph "(2)", "Table D.3", row "2a", 2nd column, replace "flexural stiffness I_I " with "flexural stiffness EI_I "; and replace "torsional stiffness I_T " with "torsional stiffness GI_T ".

25)Modifications to D.3.2

Paragraph "(1)", replace "with rigid supports" with "with hinged or rigid supports".

Paragraph "(2)", "Table D.4", last line, add:

"for K_r the radial loading (e.g. hydrostatic pressure) is supposed".

26)Modification to D.3.3

Paragraph "(1)", "Table D.7", replace " $1 - 0,45 \frac{q_{St}}{q}$ " with " $1 + 0,45 \frac{q_{St}}{q}$ ".

27)Modification to D.3.4

Paragraph "(3)", replace "the mean of all lengths $h_H \frac{1}{\sin \alpha_k}$ of the hangers" with "the mean of all lengths h_H of the hangers multiplied by $\frac{1}{\sin \alpha_k}$, where α_k (constant) is taken from Figure D.5".

28)Modification to D.3.5

Paragraph "(1)", replace "see 5.3.2(10)" with "see 5.3.2(11)".

29)Modification to E.1

Paragraph "(2)", under Equation "(E.2)", definition of " σ_{Ed} ", replace " σ_{loc} " with " $\sigma_{loc,Ed}$ "; and replace " σ_{glob} " with " $\sigma_{glob,Ed}$ ".

I.S. EN 1993-2:2006

National Foreword

This Irish Standard is the official English language version of EN 1993-2:2006, prepared by Technical Committee CEN TC 250 "Structural Eurocodes". This document supersedes ENV 1993-2:1997.

This standard forms part of a package of 58 Eurocodes, which covers the basis of structural design, actions (loadings), the main structural materials, geotechnical design and design provisions for earthquakes. The European Commission document – Guidance Paper L – Application and Use of Eurocodes provides guidance on the elaboration, implementation and use of Eurocodes.

Where a normative part of this EN allows for a choice to be made at the national level the range, possible choices are given in the normative text, and a Note will qualify it as a Nationally Determined Parameter (NDP).

To enable EN 1993-2:2006 to be used in Ireland the Nationally Determined Parameters will be published in a National Annex after public consultation has taken place.

Until the National Annex is available, publication of this European Standard is solely for education/training purposes and this standard should not be used in project design until the relevant National Annex is available.

Note: For Use of this European Standard after publication of the Irish National Annex

I.S. EN 1993-2:2006 may now be used in Ireland. The Nationally Determined Parameters, which have been prepared by the NSAI National Eurocode Advisory Committee, are included as an informative annex to the standard.

The National Annex to I.S. EN 1993-2:2006 is also available as a separate publication as recommended in Guidance Paper L.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document

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I.S. EN 1993-2:2006

EUROPEAN STANDARD

EN 1993-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

Eurocode 3 - Design of steel structures - Part 2: Steel Bridges

Eurocode 3 - Calcul des structures en acier - Partie 2:
Ponts métalliques

Eurocode 3 - Bemessung und konstruktion von Stahlbauten
- Teil 2: Stahlbrücken

This European Standard was approved by CEN on 9 January 2006.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, 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
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Foreword

This European Standard EN 1993-2, Eurocode 3: Design of steel structures Part 2: Steel bridges, has been prepared by Technical Committee CEN/TC250 « Structural Eurocodes », the Secretariat of which is held by BSI. CEN/TC250 is responsible for all Structural Eurocodes.

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 April 2007 and conflicting National Standards shall be withdrawn at latest by March 2010.

This Eurocode supersedes ENV 1993-2.

According to the CEN-CENELEC Internal Regulations, the National Standard 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, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Background of the Eurocode programme

In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 95 of the Treaty. The objective of the programme was the elimination of technical obstacles to trade and the harmonisation of technical specifications.

Within this action programme, the Commission took the initiative to establish a set of harmonised technical rules for the design of construction works which, in a first stage, would serve as an alternative to the national rules in force in the Member States and, ultimately, would replace them.

For fifteen years, the Commission, with the help of a Steering Committee with Representatives of Member States, conducted the development of the Eurocodes programme, which led to the first generation of European codes in the 1980's.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement¹ between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to the CEN through a series of Mandates, in order to provide them with a future status of European Standard (EN). This links *de facto* the Eurocodes with the provisions of all the Council's Directives and/or Commission's Decisions dealing with European standards (e.g. the Council Directive 89/106/EEC on construction products – CPD – and Council Directives 93/37/EEC, 92/50/EEC and 89/440/EEC on public works and services and equivalent EFTA Directives initiated in pursuit of setting up the internal market).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

- EN 1990 Eurocode 0: Basis of structural 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

¹ Agreement between the Commission of the European Communities and the European Committee for Standardisation (CEN) concerning the work on EUROCODES for the design of building and civil engineering works (BC/CEN/03/89).

EN 1998 Eurocode 8: Design of structures for earthquake resistance

EN 1999 Eurocode 9: Design of aluminium structures

Eurocode standards recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level where these continue to vary from State to State.

Status and field of application of Eurocodes

The Member States of the EU and EFTA recognise that Eurocodes serve as reference documents for the following purposes :

- as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly Essential Requirement N°1 - Mechanical resistance and stability - and Essential Requirement N°2 - Safety in case of fire;
- as a basis for specifying contracts for construction works and related engineering services;
- as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs)

The Eurocodes, as far as they concern the construction works themselves, have a direct relationship with the Interpretative Documents² referred to in Article 12 of the CPD, although they are of a different nature from a harmonised product standard³. Therefore, technical aspects arising from the Eurocodes work need to be adequately considered by CEN Technical Committees and/or EOTA Working Groups working on product standards with a view to achieving a full compatibility of these technical specifications with the Eurocodes.

The Eurocode standards provide common structural design rules for everyday use for the design of whole structures and component products of both a traditional and an innovative nature. Unusual forms of construction or design conditions are not specifically covered and additional expert consideration will be required by the designer in such cases.

National Standards implementing Eurocodes

The National Standards implementing Eurocodes will comprise the full text of the Eurocode (including any annexes), as published by CEN, which may be preceded by a National title page and National foreword, and may be followed by a National annex (informative).

The National Annex (informative) may only contain information on those parameters which are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned, i.e. :

- values for partial factors and/or classes where alternatives are given in the Eurocode,
- values to be used where a symbol only is given in the Eurocode,
- geographical and climatic data specific to the Member State, e.g. snow map,
- the procedure to be used where alternative procedures are given in the Eurocode,
- references to non-contradictory complementary information to assist the user to apply the Eurocode.

² According to Art. 3.3 of the CPD, the essential requirements (ERs) shall be given concrete form in interpretative documents for the creation of the necessary links between the essential requirements and the mandates for hENs and ETAGs/ETAs.

³ According to Art. 12 of the CPD the interpretative documents shall :

- a) give concrete form to the essential requirements by harmonising the terminology and the technical bases and indicating classes or levels for each requirement where necessary ;
- b) indicate methods of correlating these classes or levels of requirement with the technical specifications, e.g. methods of calculation and of proof, technical rules for project design, etc. ;
- c) serve as a reference for the establishment of harmonised standards and guidelines for European technical approvals.

The Eurocodes, *de facto*, play a similar role in the field of the ER 1 and a part of ER 2.

Links between Eurocodes and product harmonised technical specifications (ENs and ETAs)

There is a need for consistency between the harmonised technical specifications for construction products and the technical rules for works⁴. Furthermore, all the information accompanying the CE Marking of the construction products which refer to Eurocodes should clearly mention which Nationally Determined Parameters have been taken into account.

Additional information specific to EN 1993-2

EN 1993-2 is the second part of six parts of EN 1993 – Design of Steel Structures – and describes the principles and application rules for the safety and serviceability and durability of steel structures for bridges.

EN 1993-2 gives design rules which are supplementary to the generic rules in EN 1993-1-1.

EN 1993-2 is intended to be used with Eurocodes EN 1990 – Basis of design, EN 1991 – Actions on structures and the parts 2 of EN 1992 to EN 1998 when steel structures or steel components for bridges are referred to.

Matters that are already covered in those documents are not repeated.

EN 1993-2 is intended for use by

- committees drafting design related product, testing and execution standards,
- clients (e.g. for the formulation of their specific requirements),
- designers and constructors,
- relevant authorities.

Numerical values for partial factors and other reliability parameters are recommended as basic values that provide an acceptable level of reliability. They have been selected assuming that an appropriate level of workmanship and quality management applies.

National annex for EN 1993-2

This standard gives alternative procedures, values and recommendations with notes indicating where national choices may have to be made. The National Standard implementing EN 1993-2 should have a National Annex containing all Nationally Determined Parameters to be used for the design of steel structures to be constructed in the relevant country.

National choice is allowed in EN 1993-2 through:

- 2.1.3.2(1)
- 2.1.3.3(5)
- 2.1.3.4(1)
- 2.1.3.4(2)
- 2.3.1(1)
- 3.2.3(2)
- 3.2.3(3)
- 3.2.4(1)
- 3.4(1)
- 3.5(1)
- 3.6(1)

⁴ See Art.3.3 and Art.12 of the CPD, as well as clauses 4.2, 4.3.1, 4.3.2 and 5.2 of ID 1.

- 3.6(2)
- 4(1)
- 4(4)
- 5.2.1(4)
- 5.4.1(1)
- 6.1(1)P
- 6.2.2.3(1)
- 6.2.2.4(1)
- 6.3.2.3(1)
- 6.3.4.2(1)
- 6.3.4.2(7)
- 7.1(3)
- 7.3(1)
- 7.4(1)
- 8.1.3.2.1(1)
- 8.1.6.3(1)
- 8.2.1.4(1)
- 8.2.1.5(1)
- 8.2.1.6(1)
- 8.2.10(1)
- 8.2.13(1)
- 8.2.14(1)
- 9.1.2(1)
- 9.1.3(1)
- 9.3(1)P
- 9.3(2)P
- 9.4.1(6)
- 9.5.2(2)
- 9.5.2(3)
- 9.5.2(5)
- 9.5.2(6)
- 9.5.2(7)
- 9.5.3(2) (two places)
- 9.6(1) (two places)
- 9.7(1)
- A.3.3(1)P
- A.3.6(2)
- A.4.2.1(2)
- A.4.2.1(3)
- A.4.2.1(4)
- A.4.2.4(2)
- C.1.1(2)

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- C.1.2.2(1)
- C.1.2.2(2)
- E.2(1)

1 General

1.1 Scope

1.1.1 Scope of Eurocode 3

- (1) See 1.1.1(1), (2), (3), (4), (5) and (6) of EN 1993-1-1.

1.1.2 Scope of Part 2 of Eurocode 3

- (1) EN 1993-2 provides a general basis for the structural design of steel bridges and steel parts of composite bridges. It gives provisions that supplement, modify or supersede the equivalent provisions given in the various parts of EN 1993-1.

- (2) The design criteria for composite bridges are covered in EN 1994-2.

- (3) The design of high strength cables and related parts are included in EN 1993-1-11.

- (4) This European Standard is concerned only with the resistance, serviceability and durability of bridge structures. Other aspects of design are not considered.

- (5) For the execution of steel bridge structures, EN 1090 should be taken into account.

NOTE: As long as EN 1090 is not yet available a provisional guidance is given in Annex C.

- (6) Execution is covered to the extent that is necessary to indicate the quality of the construction materials and products that should be used and the standard of workmanship needed to comply with the assumptions of the design rules.

- (7) Special requirements of seismic design are not covered. Reference should be made to the requirements given in EN 1998, which complements and modifies the rules of EN 1993-2 specifically for this purpose.

1.2 Normative references

- (1) This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication applies (including amendments).

- (2) In addition to the normative references given in EN 1990 and EN 1993-1 the following references should apply:

EN 1090	Execution of steel structures and aluminium structures
EN 1337	Structural bearings
EN 10029:1991	Specification for tolerances on dimensions, shape and mass for hot rolled steel plates 3 mm thick or above.
EN 10164	Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions.
EN ISO 5817	Arc-welded joints in steel - Guidance on quality levels for imperfections.
EN ISO 12944-3	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Design considerations.
EN ISO 9013:2002	Thermal cutting - Classification of thermal cuts - Geometrical product specification and quality tolerances.

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