



NSAI
Standards

Irish Standard
I.S. EN 1993-1-3:2006+NA:2010

Eurocode 3 - Design of steel structures - Part 1-3: General rules - Supplementary rules for cold-formed members and sheeting (Including Irish National Annex)

I.S. EN 1993-1-3:2006+NA:2010

Incorporating amendments/corrigenda issued since publication:

EN 1993-1-3:2006/AC:2009
NA to I.S. EN 1993-1-3:2006

This document replaces:
ENV 1993-1-3:1996

This document is based on:
EN 1993-1-3:2006+NA:2010
ENV 1993-1-3:1996

Published:
25 October, 2006
17 April, 1996

This document was published
under the authority of the NSAI
and comes into effect on:
25 March, 2010

ICS number:
91.010.30

NSAI

1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:

T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

I.S. EN 1993-1-3:2006

EUROPEAN STANDARD

EN 1993-1-3:2006/AC

NORME EUROPÉENNE

November 2009

EUROPÄISCHE NORM

Novembre 2009

November 2009

ICS 91.010.30

English version
Version Française
Deutsche Fassung

Eurocode 3 - Design of steel structures - Part 1-3: General rules -
Supplementary rules for cold-formed members and sheeting

Eurocode 3 - Calcul des structures en acier
- Partie 1-3: Règles générales - Règles
supplémentaires pour les profilés et
plaques formés à froid

Bemessung und Konstruktion von
Stahlbauten - Teil 1-3: Allgemeine Regeln -
Ergänzende Regeln für kaltgeformte
dünnwandige Bauteile und Bleche

This corrigendum becomes effective on 11 November 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 11 novembre 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 11. November 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

© 2009 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.
Tous droits d'exploitation sous quelque forme et de quelque manière que ce soit réservés dans le monde entier aux
membres nationaux du CEN.
Alle Rechte der Verwertung, gleich in welcher Form und in welchem Verfahren, sind weltweit den nationalen Mitgliedern
von CEN vorbehalten.

Ref. No.: EN 1993-1-3:2006/AC:2009 D/E/F

1) Modification to 1.1

Paragraph "(1)", delete three times "thin gauge".

2) Modification to 3.2.1

Paragraph "(1)", replace "tensile strength" with "ultimate tensile strength".

3) Modification to 3.2.4

Paragraph "(3)", in Equation "(3.3b)", delete the second "=" sign.

4) Modification to Clause 4

Paragraph "(1)", "NOTE", replace "EN 1090, 9.3.1" with "EN 1090-2, 9.3.1".

5) Modification to 5.5.2

Paragraph "(3)", replace two times "from tables 4.1 and 4.2" with "from tables 4.1 and 4.2 of EN 1993-1-5".

6) Modification to 5.5.3.2

Paragraph "(10)", replace "5.5.2(5)" with "5.5.2(1)".

7) Modification to 5.5.3.3

Paragraph "(9)", replace "5.5.2(5)" with "5.5.2(1)".

8) Modification to 5.5.3.4.4

Paragraph "(1)", 2nd line, replace "interaction between the distortional buckling (flexural buckling of the flange stiffeners and the web stiffeners)" with "interaction between the flexural buckling of the flange stiffeners and the web stiffeners".

9) Modifications to 6.1.2

Paragraph "(1)", replace "see 3.2.3" with "see 3.2.2".

Paragraph "(2)", replace "EN 1993-1-8, 3.6.3" with "EN 1993-1-8, 3.10.3".

10) Modification to 6.1.3

Paragraph "(1)", delete:

" $\bar{\lambda}_{e \max}$ is the relative slenderness of the element which corresponds to the largest value of $\bar{\lambda}_e / \bar{\lambda}_{e0}$;".

11) Modification to 6.1.4.1

Paragraph "(1)", delete the 12th line:

" For stiffened elements $\bar{\lambda}_e = \bar{\lambda}_d$ and $\bar{\lambda}_{e0} = 0,65$, see 5.5.3. "

12) Modifications to 6.1.7.2

Paragraph "(4)", under Equation "(6.16d)", Equations for " k_7 ", " k_8 " and " k_{10} ", replace:

- " $k_7 = 1 + s_s / t / 750$ " with " $k_7 = 1 + h_w / (t \times 750)$ ";
- " $k_8 = (1,10 - s_s / t / 665) / k$ " with " $k_8 = (1,10 - h_w / (t \times 665)) / k$ ";
- and " $k_{10} = (0,98 - s_s / t / 865) / k$ " with " $k_{10} = (0,98 - h_w / (t \times 865)) / k$ ".

13) Modification to 6.1.9

Paragraph "(3)", replace " $M_{cy,Rd,ten} \leq m_{cy,Rd,com}$ " with " $M_{cy,Rd,ten} \leq M_{cy,Rd,com}$ ".

14) Modifications to 6.2.3

Paragraph "(6)", replace:

"(6) For doubly symmetric cross-sections (e.g. $y_o = z_o = 0$), the elastic critical force $N_{cr,TF}$ for torsional-flexural buckling should be determined from:

$$N_{cr,TF} = N_{cr,T} \quad \dots(6.34)$$

provided $N_{cr,T} < N_{cr,y}$ and $N_{cr,T} < N_{cr,z}$."

with:

"(6) For doubly symmetric cross-sections (e.g. $y_o = z_o = 0$), the elastic critical force N_{cr} should be determined from:

$$N_{cr} = N_{cr,i} \quad \dots(6.34)$$

where $N_{cr,i}$ should be determined as minimum from three values: $N_{cr,y}$, $N_{cr,z}$, $N_{cr,T}$."

Paragraph "(7)", end of the paragraph, add the following text:

"Equation (6.35) is valid only if the torsional and flexural buckling lengths are equal $l_y = l_T$."

15) Modification to 6.2.5

Paragraph "(2)", 1st line, replace "(6.38)" with "(6.36)".

16) Modification to 8.2

Paragraph "(2)", replace "6.2.2.1(2)" with "6.2.2(1)".

17) Modifications to 8.3

Paragraph "(13)", "Table 8.2", "NOTE:*2)", replace two times "skrews" with "screws".

Paragraph "(13)", "Table 8.4", 8th row from the top, replace " $3 \text{ mm} > t \geq 0,75 \text{ mm}$ " with " $0,75 \text{ mm} \leq t < 3 \text{ mm}$ ".

EN 1993-1-3:2006/AC:2009 (E)**18) Modification to 8.5.3**

Paragraph "(5)", list entry "(i)", replace two times " $F_{w,Sd}$ " with " $F_{w,Rd}$ ".

19) Modifications to 10.1.1

Paragraph "(5)", correct "trapetzoidal" into "trapezoidal".

Paragraph "(6)", correct "trapetzoidal" into "trapezoidal".

20) Modifications to 10.1.4.2

Paragraph "(7)", 2nd and 3rd lines, replace "The formula (10.10a)" with "The formula (10.9)".

Paragraph "(7)", 4th line, replace "10.1.4.2(5)" with "(5)".

21) Modifications to 10.1.6

Paragraph "(2)", "Table 10.5", 4th row "C-beam, gravity loading", second column "Reaction force on bottom flange R_1 ", replace " $-(1-\zeta)k_h q_{Ed} L/2$ " with " $(1-\zeta)k_h q_{Ed} L/2$ ".

Paragraph "(2)", "Table 10.5", 4th row "C-beam, gravity loading", third column "Reaction force on top flange R_2 ", replace " $(1-\zeta)k_h q_{Ed} L/2$ " with " $-(1-\zeta)k_h q_{Ed} L/2$ ".

Paragraph "(2)", "Table 10.5", 5th row "C-beam, uplift loading", second column "Reaction force on bottom flange R_1 ", replace " $(1-\zeta)k_h q_{Ed} L/2$ " with " $-(1-\zeta)k_h q_{Ed} L/2$ ".

Paragraph "(2)", "Table 10.5", 5th row "C-beam, uplift loading", third column "Reaction force on top flange R_2 ", replace " $-(1-\zeta)k_h q_{Ed} L/2$ " with " $(1-\zeta)k_h q_{Ed} L/2$ ".

Paragraph "(3)", replace this paragraph with the following one:

"(3) The factor ζ may be taken as $\zeta = 1 - \sqrt[3]{\kappa_R^2}$ where κ_R is the correction factor given in Table 10.1, and the factor ξ may be taken as $\xi = 1,5\zeta$."

22) Modification to 10.2.1

Paragraph "(1)", replace in the second sentence "by attached profiled steel sheeting" with "by attached profiled steel sheeting or by steel purlin or by similar component".

23) Modifications to 10.4

Paragraph "(2)", replace in the first sentence "using 5.1" with "using 5".

Paragraph "(2)", Equation "(10.25)", replace " $t_{a,eff} = 1,18t \left(1 - \frac{d}{0,9a} \right)$ " with: " $t_{a,eff} = 1,18t(1 - 0,9\frac{d}{a})$ ".

Paragraph "(4)", replace in the first sentence "using 6.1.9" with "using 6.1.7".

24) Modification to A.4.1

Paragraph "(2)", 6th line, delete "(rare)".

25) Modifications to A.6.2

Paragraph "(5)", replace "in which μ_R is the resistance adjustment coefficient" with "in which μ_R is the adjustment coefficient".

Paragraph "(7)", add after the note as normal clause text:

"For the adjustment of second moment of area, where linear behaviour is observed under the serviceability limit state loading, the exponents in the formula (A.9) should be taken as follows: $\alpha = 0,0$ and $\beta = 1,0$."

26) Modifications to Annex E

Paragraph "(1)", replace "the purlins are restraint... of table E.1 are met" with "the purlins are restrained ... of table 10.3 are met".

Paragraph "(3)", "NOTE", replace reference to "1.6.4" with "1.5.4".

I.S. EN 1993-1-3:2006

National Foreword

This Irish Standard is the official English language version of EN 1993-1-3:2006, prepared by Technical Committee CEN TC 250 "Structural Eurocodes". This document supersedes ENV 1993-1-3:1996.

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 1993-1-3:2006 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 1993-1-3:2006 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 1993-1-3:2006 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 |
|--|

English Version

Eurocode 3 - Design of steel structures - Part 1-3: General rules - Supplementary rules for cold-formed members and sheeting

Eurocode 3 - Calcul des structures en acier - Partie 1-3:
Règles générales - Règles supplémentaires pour les
profilés et plaques à parois minces formés à froid

Eurocode 3 - Bemessung und Konstruktion von
Stahlbauten - Teil 1-3: Allgemeine Regeln - Ergänzende
Regeln für kaltgeformte dünnwandige Bauteile und Bleche

This European Standard was approved by CEN on 16 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
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Content

| | | |
|-----------|--|------------|
| 1 | Introduction | 5 |
| 1.1 | Scope | 5 |
| 1.2 | Normative references | 5 |
| 1.3 | Terms and definitions | 6 |
| 1.4 | Symbols | 7 |
| 1.5 | Terminology and conventions for dimensions | 8 |
| 2 | Basis of design | 11 |
| 3 | Materials | 12 |
| 3.1 | General | 12 |
| 3.2 | Structural steel | 15 |
| 3.3 | Connecting devices | 17 |
| 4 | Durability | 17 |
| 5 | Structural analysis | 18 |
| 5.1 | Influence of rounded corners | 18 |
| 5.2 | Geometrical proportions | 20 |
| 5.3 | Structural modelling for analysis | 22 |
| 5.4 | Flange curling | 22 |
| 5.5 | Local and distortional buckling | 23 |
| 5.6 | Plate buckling between fasteners | 41 |
| 6 | Ultimate limit states | 41 |
| 6.1 | Resistance of cross-sections | 41 |
| 6.2 | Buckling resistance | 56 |
| 6.3 | Bending and axial tension | 60 |
| 7 | Serviceability limit states | 60 |
| 7.1 | General | 60 |
| 7.2 | Plastic deformation | 60 |
| 7.3 | Deflections | 60 |
| 8 | Design of joints | 61 |
| 8.1 | General | 61 |
| 8.2 | Splices and end connections of members subject to compression | 61 |
| 8.3 | Connections with mechanical fasteners | 61 |
| 8.4 | Spot welds | 68 |
| 8.5 | Lap welds | 69 |
| 9 | Design assisted by testing | 73 |
| 10 | Special considerations for purlins, liner trays and sheetings | 74 |
| 10.1 | Beams restrained by sheeting | 74 |
| 10.2 | Liner trays restrained by sheeting | 92 |
| 10.3 | Stressed skin design | 95 |
| 10.4 | Perforated sheeting | 99 |
| | Annex A [normative] – Testing procedures | 100 |
| A.1 | General | 100 |
| A.2 | Tests on profiled sheets and liner trays | 100 |
| A.3 | Tests on cold-formed members | 105 |
| A.4 | Tests on structures and portions of structures | 108 |
| A.5 | Tests on torsionally restrained beams | 110 |
| A.6 | Evaluation of test results | 114 |

| | |
|---|------------|
| Annex B [informative] – Durability of fasteners | 119 |
| Annex C [informative] – Cross section constants for thin-walled cross sections | 121 |
| C.1 Open cross sections | 121 |
| C.2 Cross section constants for open cross section with branches | 123 |
| C.3 Torsion constant and shear centre of cross section with closed part | 124 |
| Annex D [informative] – Mixed effective width/effective thickness method for outstand elements | 125 |
| Annex E [Informative] – Simplified design for purlins | 127 |

Foreword

This European Standard EN 1993-1-3, Eurocode 3: Design of steel structures: Part 1-3 General rules – Supplementary rules for cold formed members and sheeting, 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 1993-1-3.

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.

National annex for EN 1993-1-3

This standard gives alternative procedures, values and recommendations for classes with notes indicating where national choices may have to be made. Therefore the National Standard implementing EN 1993-1-3 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 1993-1-3 through clauses:

- 2(3)P
- 2(5)
- 3.1(3) Note 1 and Note 2
- 3.2.4(1)
- 5.3(4)
- 8.3(5)
- 8.3(13), Table 8.1
- 8.3(13), Table 8.2
- 8.3(13), Table 8.3
- 8.3(13), Table 8.4
- 8.4(5)
- 8.5.1(4)
- 9(2)
- 10.1.1(1)
- 10.1.4.2(1)
- A.1(1), NOTE 2
- A.1(1), NOTE 3
- A.6.4(4)
- E(1)

1 Introduction

1.1 Scope

(1) EN 1993-1-3 gives design requirements for cold-formed thin gauge members and sheeting. It applies to cold-formed steel products made from coated or uncoated thin gauge hot or cold rolled sheet or strip, that have been cold-formed by such processes as cold-rolled forming or press-braking. It may also be used for the design of profiled steel sheeting for composite steel and concrete slabs at the construction stage, see EN 1994. The execution of steel structures made of cold-formed thin gauge members and sheeting is covered in EN 1090.

NOTE: The rules in this part complement the rules in other parts of EN 1993-1.

- (2) Methods are also given for stressed-skin design using steel sheeting as a structural diaphragm.
- (3) This part does not apply to cold-formed circular and rectangular structural hollow sections supplied to EN 10219, for which reference should be made to EN 1993-1-1 and EN 1993-1-8.
- (4) EN 1993-1-3 gives methods for design by calculation and for design assisted by testing. The methods for design by calculation apply only within stated ranges of material properties and geometrical proportions for which sufficient experience and test evidence is available. These limitations do not apply to design assisted by testing.
- (5) EN 1993-1-3 does not cover load arrangement for testing for loads during execution and maintenance.
- (6) The calculation rules given in this standard are only valid if the tolerances of the cold formed members comply with EN 1090-2

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this European Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

However, parties to agreements based on this European Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

| | |
|------------|---|
| EN 1993 | <i>Eurocode 3 – Design of steel structures</i> Part 1-1 to part 1-12 |
| EN 10002 | <i>Metallic materials - Tensile testing:</i> Part 1: <i>Method of test (at ambient temperature);</i> |
| EN 10025-1 | <i>Hot-rolled products of structural steels - Part 1: General delivery conditions;</i> |
| EN 10025-2 | <i>Hot-rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels;</i> |
| EN 10025-3 | <i>Hot-rolled products of structural steels - Part 3: Technical delivery conditions for normalized / normalized rolled weldable fine grain structural steels;</i> |
| EN 10025-4 | <i>Hot-rolled products of structural steels - Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels;</i> |
| EN 10025-5 | <i>Hot-rolled products of structural steels - Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance;</i> |
| EN 10143 | <i>Continuously hot-dip metal coated steel sheet and strip - Tolerances on dimensions and shape;</i> |
| EN 10149 | <i>Hot rolled flat products made of high yield strength steels for cold-forming:</i> Part 2: <i>Delivery conditions for normalized/normalized rolled steels;</i> Part 3: <i>Delivery conditions for thermomechanical rolled steels;</i> |
| EN 10204 | <i>Metallic products. Types of inspection documents (includes amendment A 1:1995);</i> |
| EN 10268 | <i>Cold-rolled flat products made of high yield strength micro-alloyed steels for cold forming - General delivery conditions;</i> |

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-