BS EN 1993-1-3:2006 Incorporating corrigendum

November 2009

Eurocode 3 — Design of steel structures —

Part 1-3: General rules — Supplementary rules for cold-formed members and sheeting

ICS 91.010.30; 91.080.10



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National foreword

This British Standard is the UK implementation of EN 1993-1-3:2006, incorporating corrigendum November 2009. It supersedes DD ENV 1993-1-3:2001 which is withdrawn. It partially supersedes BS 5950-5:1998, BS 5950-6:1995 and BS 5950-9:1994.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum November 2009 is indicated in the text by $\boxed{AC_1}$ $\langle \overrightarrow{AC_1}$.

The UK participation in its preparation was entrusted by Technical Committee B/525, Building and civil engineering structures, to Subcommittee B/525/31, Structural use of steel.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

The structural Eurocodes are divided into packages by grouping Eurocodes for each of the main materials: concrete, steel, composite concrete and steel, timber, masonry and aluminium; this is to enable a common date of withdrawal (DOW) for all the relevant parts that are needed for a particular design. The conflicting national standards will be withdrawn at the end of the coexistence period, after all the EN Eurocodes of a package are available. Following publication of the EN, there is a period allowed for national calibration during which the National Annex is issued, followed by a coexistence period of a maximum three years. During the coexistence period Member States are encouraged to adapt their national provisions. Conflicting national standards will be withdrawn by March 2010 at the latest. Where a normative part of this EN allows for a choice to be made at national level, the range and possible choice will be given in the normative text, and a note will qualify it as a Nationally Determined Parameter (NDP). NDPs can be a specific value for a factor, a specific level or class, a particular method or a particular application rule if several are proposed in the EN. To enable EN 1993-1-3 to be used in the UK, the NDPs will be published in a National Annex, which will be made available by BSI in due course after public consultation has taken place.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

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EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

EN 1993-1-3

October 2006

ICS 91.010.30

Supersedes ENV 1993-1-3:1996 Incorporating corrigendum November 2009

English Version

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This European Standard was approved by CEN on 16 January 2006.

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

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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 members and sheeting. It applies to cold-formed steel products made from coated or uncoated 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 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 Eurocode 3 – Design of steel structures

Part 1-1 to part 1-12

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

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EN 10292 Continuously hot-dip coated strip and sheet of steels with higher yield strength for cold forming - Technical delivery conditions; EN 10326 Continuously hot-dip coated strip and sheet of structural steels - Technical delivery conditions; Continuously hot-dip coated strip and sheet of low carbon steels for cold forming - Technical EN 10327 delivery conditions; EN-ISO 12944-2 Paints and vanishes. Corrosion protection of steel structures by protective paint systems. Part 2: Classification of environments (ISO 12944-2:1998); EN 1090-2 Execution of steel structures and aluminium structures Part 2: Technical requirements for steel structures: EN 1994 *Eurocode 4: Design of composite steel and concrete structures;* EN ISO 1478 *Tapping screws thread;* EN ISO 1479 *Hexagon head tapping screws;* EN ISO 2702 *Heat-treated steel tapping screws - Mechanical properties;* EN ISO 7049 Cross recessed pan head tapping screws; EN ISO 10684 Fasteners – hot deep galvanized coatings ISO 4997 *Cold reduced steel sheet of structural quality;* EN 508-1 Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet - Part 1: Steel; FEM 10.2.02 Federation Europeenne de la manutention, Secion X, Equipment et proceedes de stockage, FEM 10.2.02, The design of static steel pallet racking, Racking design code, April 2001 Version 1.02.

1.3 Terms and definitions

Supplementary to EN 1993-1-1, for the purposes of this Part 1-3 of EN 1993, the following terms and definitions apply:

1.3.1

basic material

The flat sheet steel material out of which cold-formed sections and profiled sheets are made by cold-forming.

1.3.2

basic yield strength

The tensile yield strength of the basic material.

1.3.3

diaphragm action

Structural behaviour involving in-plane shear in the sheeting.

1.3.4

liner tray

Profiled sheet with large lipped edge stiffeners, suitable for interlocking with adjacent liner trays to form a plane of ribbed sheeting that is capable of supporting a parallel plane of profiled sheeting spanning perpendicular to the span of the liner trays.

1.3.5

partial restraint

Restriction of the lateral or rotational movement, or the torsional or warping deformation, of a member or element, that increases its buckling resistance in a similar way to a spring support, but to a lesser extent than a rigid support.

1.3.6

relative slenderness

A normalized non-dimensional slenderness ratio.

1.3.7

restraint

Restriction of the lateral or rotational movement, or the torsional or warping deformation, of a member or element, that increases its buckling resistance to the same extent as a rigid support.

1.3.8

stressed-skin design

A design method that allows for the contribution made by diaphragm action in the sheeting to the stiffness and strength of a structure.

1.3.9

support

A location at which a member is able to transfer forces or moments to a foundation, or to another member or other structural component.

1.3.10

nominal thickness

A target average thickness inclusive zinc and other metallic coating layers when present rolled and defined by the steel supplier (t_{nom} not including organic coatings).

1.3.11

steel core thickness

A nominal thickness minus zinc and other metallic coating layers (t_{cor}).

1.3.12

design thickness

the steel core thickness used in design by calculation according to 1.5.3(6) and 3.2.4.

1.4 Symbols

(1) In addition to those given in EN 1993-1-1, the following main symbols are used:

- $f_{\rm y}$ yield strength
- f_{ya} average yield strength
- f_{yb} basic yield strength
- t design core thickness of steel material before cold forming, exclusive of metal and organic coating
- $t_{\rm nom}$ nominal sheet thickness after cold forming inclusive of zinc and other metallic coating not including organic coating
- $t_{\rm cor}$ the nominal thickness minus zinc and other metallic coating
- *K* spring stiffness for displacement
- *C* spring stiffness for rotation
- (2) Additional symbols are defined where they first occur.
- (3) A symbol may have several meanings in this part.

1.5 Terminology and conventions for dimensions

1.5.1 Form of sections

(1) Cold-formed members and profiled sheets have within the permitted tolerances a constant nominal thickness over their entire length and may have either a uniform cross section or a tapering cross section along their length.

(2) The cross-sections of cold-formed members and profiled sheets essentially comprise a number of plane elements joined by curved elements.

(3) Typical forms of sections for cold-formed members are shown in figure 1.1.

NOTE: The calculation methods of this Part 1-3 of EN 1993 does not cover all the cases shown in figures 1.1-1.2.



c) Closed built-up sections

Figure 1.1: Typical forms of sections for cold-formed members

(4) Examples of cross-sections for cold-formed members and sheets are illustrated in figure 1.2.

NOTE: All rules in this Part 1-3 of EN 1993 relate to the main axis properties, which are defined by the main axes y - y and z - z for symmetrical sections and u - u and v - v for unsymmetrical sections as e.g. angles and Zed-sections. In some cases the bending axis is imposed by connected structural elements whether the cross-section is symmetric or not.