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Eurocode 3 - Design of steel structures - Part 1-3: Cold-formed members and sheeting

Eurocode 3 - Bemessung und Konstruktion von Stahlbauten - Teil 1-3: Kaltgeformte Bauteile und Profiltafeln

Eurocode 3 - Calcul des structures en acier - Partie 1-3: Règles générales - Profilés et plaques formés à froid

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Eurocode 3 - Design of steel structures - Part 1-3: Cold-formed members and sheeting

Eurocode 3 - Calcul des structures en acier - Partie 1-3:
Règles générales - Profilés et plaques formés à froid

Eurocode 3 - Bemessung und Konstruktion von
Stahlbauten - Teil 1-3: Kaltgeformte Bauteile und
Profiltafeln

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.

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

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

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EN 1993-1-3:2024 (E)

European foreword

This document (EN 1993-1-3:2024) has been prepared by Technical Committee CEN/TC 250 “Structural Codes”, 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of an identical text or by endorsement, at the latest by September 2027 and conflicting national standards shall be withdrawn at the latest by March 2028.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 1993-1-3:2006 and its corrigenda.

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.

The main changes compared to the previous edition are listed below:

- Harmonization of wording according to the latest editions of EN 1993-1-1, EN 1993-1-5 and EN 1993-1-8;
- Nominal values of ultimate tensile strength (Table 5.1) adjusted to EN 1993-1-1 or the relevant product standards for harmonization (Clause 5);
- Minor specification added for the design of sinusoidal sheeting for clarification (7.6.5);
- Minor specification added for the design of trapezoidal sheeting in axial compression (8.1.3);
- Design of cross-sectional resistance to transverse forces of cross-sections with two or more unstiffened webs specified depending on the type of support (8.1.6.3);
- Design Formula for cross-sectional resistance of sections in combined axial force, bending moment, shear force and torsion reviewed for clarification (8.1.10);
- Minor specifications and explanations added for the buckling design of sections in combined compression and bending (8.2.5);
- Specifications of the design provisions in serviceability limit states (text converted into formulae) for clarification (Clause 9);
- Specifications for the design of trapezoidal sheeting with overlaps for clarification (11.3.4);

- Specifications for the bending moment resistance of liner trays for clarification (11.2.2);
- Specifications of the test set-up of single span tests for a clear uniform experimental test procedure (A.5.2);
- Specifications of the test set-up and assessment criteria of tests on sheeting (for walkability) for a clear uniform experimental test procedure (A.5.6);
- Special provisions for fasteners made of stainless steel in relation to corrosion environment deleted; general reference to EN 1993-1-4 included (Annex B).

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 organizations 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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EN 1993-1-3:2024 (E)**0 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, soft-ware 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 1993 (all parts)

EN 1993 (all parts) applies to the design of buildings and civil engineering works in steel. It complies with the principles and requirements for the safety and serviceability of structures, the basis of their design and verification that are given in EN 1990 — Basis of structural and geotechnical design.

EN 1993 (all parts) is concerned only with requirements for resistance, serviceability, durability and fire resistance of steel structures. Other requirements, e.g. concerning thermal or sound insulation, are not covered.

EN 1993 is subdivided in various parts:

EN 1993-1, *Design of Steel Structures — Part 1: General rules and rules for buildings;*

EN 1993-2, *Design of Steel Structures — Part 2: Bridges;*

EN 1993-3, *Design of Steel Structures — Part 3: Towers, masts and chimneys;*

EN 1993-4, *Design of Steel Structures — Part 4: Silos and tanks;*

EN 1993-5, *Design of Steel Structures — Part 5: Piling*;

EN 1993-6, *Design of Steel Structures — Part 6: Crane supporting structures*;

EN 1993-7, *Design of steel structures — Part 7: Sandwich panels*.

EN 1993-1 in itself does not exist as a physical document, but comprises the following 14 separate parts, the basic part being EN 1993-1-1:

EN 1993-1-1, *Design of Steel Structures — Part 1-1: General rules and rules for buildings*;

EN 1993-1-2, *Design of Steel Structures — Part 1-2: Structural fire design*;

EN 1993-1-3, *Design of Steel Structures — Part 1-3: Cold-formed members and sheeting*;

NOTE Cold formed hollow sections supplied according to EN 10219 (all parts) are covered in EN 1993-1-1.

EN 1993-1-4, *Design of Steel Structures — Part 1-4: Stainless steel structures*;

EN 1993-1-5, *Design of Steel Structures — Part 1-5: Plated structural elements*;

EN 1993-1-6, *Design of Steel Structures — Part 1-6: Strength and stability of shell structures*;

EN 1993-1-7, *Design of Steel Structures — Part 1-7: Plate assemblies with elements under transverse loads*;

EN 1993-1-8, *Design of Steel Structures — Part 1-8: Joints*;

EN 1993-1-9, *Design of Steel Structures — Part 1-9: Fatigue*;

EN 1993-1-10, *Design of Steel Structures — Part 1-10: Material toughness and through-thickness properties*;

EN 1993-1-11, *Design of Steel Structures — Part 1-11: Tension components*;

EN 1993-1-12, *Design of Steel Structures — Part 1-12: Additional rules for steel grades up to S960*;

EN 1993-1-13, *Design of Steel Structures — Part 1-13: Beams with large web openings*;

EN 1993-1-14, *Design of Steel Structures — Part 1-14: Design assisted by finite element analysis*.

All subsequent parts EN 1993-1-2 to EN 1993-1-14 treat general topics that are independent from the structural type like structural fire design, cold-formed members and sheeting, stainless steels, plated structural elements, etc.

All subsequent parts numbered EN 1993-2 to EN 1993-7 treat topics relevant for a specific structural type like steel bridges, towers, masts and chimneys, silos and tanks, piling, crane supporting structures, etc. EN 1993-2 to EN 1993-7 refer to the generic rules in EN 1993-1 and supplement, modify or supersede them.

0.3 Introduction to EN 1993-1-3

EN 1993-1-3 gives supplementary design rules for cold-formed steel members and sheeting. The focus in EN 1993-1-3 is on design methods and design rules for individual cold-formed members (beams, columns and beam-columns), sheeting and liner trays regarding resistance, stability and serviceability.

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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 1993-1-3

National choice is allowed in this standard where explicitly stated within notes. National choice includes the selection of values for Nationally Determined Parameters (NDPs).

The national standard implementing EN 1993-1-3 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 standard is to be used.

When no national choice is made and no default is given in this standard, 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 1993-1-3 through notes to the following clauses:

4.2(3)	4.2(4)	4.2(5)	5.2.1(3)
7.1(2)	7.2.1(6)	8.2.5(2)	10.3(3)
10.3(3)	10.3(3)	10.3(3)	12(1)
A.1(1)	A.9.4(3)		

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National choice is allowed in EN 1993-1-3 on the application of the following informative annexes:

Annex B

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 1993-1-3

(1) This document provides rules for structural design of cold-formed steel members and sheeting.

(2) This document applies to cold-formed steel products made from coated or uncoated hot- or cold-rolled sheet or strip, which have been cold-formed by processes such as roll-forming or press-braking. It also covers sheeting and members which are curved during fabrication by continuous bending or roll-forming. Sheeting which has the curvature created by crushing the inner flanges is not included. This document is also applicable to the design of profiled steel sheeting for composite steel and concrete slabs at the construction stage, see EN 1994 (all parts). The execution of steel structures made of cold-formed steel members and sheeting is covered in EN 1090-4. Provisions for bolted connections are provided in EN 1090-2.

NOTE The rules in EN 1993-1-3 complement the rules in the other parts of EN 1993-1.

(3) Methods are also given for stressed-skin design, using steel sheeting as a structural diaphragm.

(4) This document does not apply to cold-formed circular and rectangular structural hollow sections supplied to EN 10219 (all parts), for which reference is made to EN 1993-1-1 and EN 1993-1-8.

(5) This document provides methods for design by calculation and for design assisted by testing. The methods for design by calculation apply only within the stated ranges of material properties and geometric proportions, for which sufficient experience and test evidence is available. These limitations do not apply to design assisted by testing.

1.2 Assumptions

(1) Unless specifically stated, EN 1990, EN 1991 (all parts) and EN 1993-1-1 apply.

(2) The design methods given in EN 1993-1-3 are applicable if:

- the execution quality is as specified in EN 1090-4, the execution quality of bolted connections is as specified in EN 1090-2, and
- the construction materials and products are as specified in the relevant parts of EN 1993 (all parts), or in the relevant material and product specifications.

(3) EN 1993 is intended to be used in conjunction with:

- the parts of EN 1992 to EN 1999 where steel structures or steel components are referred to within those documents;
- EN standards for construction products relevant to steel 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. through 'should' clauses) and permissions (i.e. through 'may' clauses).

EN 1090-2, *Execution of steel structures and aluminium structures — Part 2: Technical requirements for steel structures*

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EN 1090-4, *Execution of steel structures and aluminium structures — Part 4: Technical requirements for cold-formed structural steel elements and cold-formed structures for roof, ceiling, floor and wall applications*

EN 1990, *Eurocode — Basis of structural and geotechnical design*

EN 1991 (all parts), *Eurocode 1 — Actions on structures*

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

EN 1993-1-1:2022, *Eurocode 3 — Design of steel structures — Part 1-1: General rules and rules for buildings*

EN 14509, *Self-supporting double skin metal faced insulating panels — Factory made products — Specifications*

EN ISO 7438, *Metallic materials — Bend test (ISO 7438)*

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 Material**3.1.1.1****basic material**

flat steel sheet material used for cold-forming sections and profiled sheeting

3.1.1.2**basic yield strength**

tensile yield strength of the basic material [SIST EN 1993-1-3:2024](https://standards.iteh.ai/SIST/1adc4aab-a752-4f2b-a7d7-8dd0229fadaf/sist-en-1993-1-3-2024)

3.1.1.3**nominal thickness**

target average thickness after cold-forming specified by the steel supplier, inclusive of zinc and other metallic coating layers, but not including organic coatings

3.1.1.4**steel core thickness**

nominal thickness minus zinc and other metallic coating layers

3.1.1.5**coil**

storage system where a continuous plate is wound onto a drum

3.1.1.6**cold-forming**

procedure of metal-forming executed near room temperature without the addition of heat

3.1.1.7**press-braking**

method of cold-forming using a brake press, where a metal sheet is bent between a punch and die

3.1.1.8**roll-forming**

metal-forming process involving the continuous bending of a steel sheet into a cross-section by forcing it through successive sets of rolls

3.1.1.9**galvanizing**

zinc coating for corrosion protection

3.1.1.10**harmonized product standard**

European Standard developed by a recognized European Standards Organization: CEN, CENELEC or ETSI, in response to a request from the European Commission to one of these organizations

3.1.2 Cold-formed steel members, sheeting and sandwich panels**3.1.2.1****member**

structural element with cross-sectional dimensions much smaller than its length

Note 1 to entry: Examples of typical cross-sectional shapes of cold-formed steel members are shown in Figure 3.1. Cross-sections of cold-formed steel members can either be unstiffened or incorporate longitudinal stiffeners in the webs, the flanges or both.

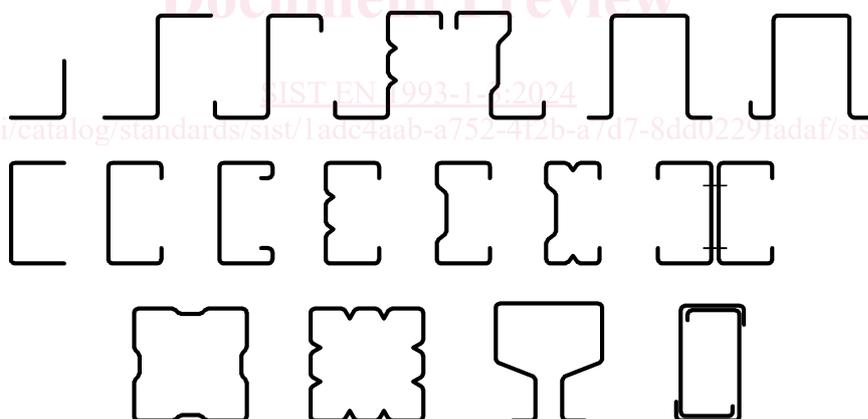


Figure 3.1 — Typical cross-sectional shapes of cold-formed members

3.1.2.2**sheeting**

structural element with a depth much smaller than its width and length, typically used as cladding or roofing or decking

Note 1 to entry: Examples of typical cross-sectional shapes of sheeting are shown in Figure 3.2. Cross-sections of sheeting can either be unstiffened or incorporate longitudinal stiffeners in the webs, the flanges or both.

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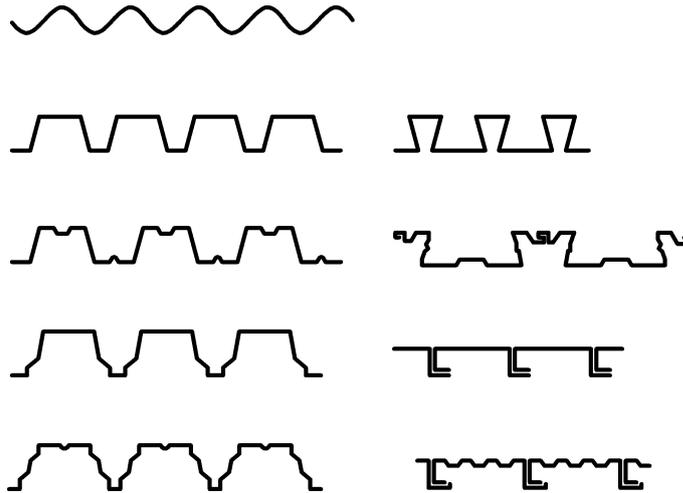


Figure 3.2 — Examples of cold-formed profiled sheeting and liner trays

3.1.2.3

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

Note 1 to entry: Examples of typical cross-sectional shapes of liner trays are shown in Figure 3.2.

3.1.2.4

sandwich panel

cladding or roofing system consisting of a typically low-density core bonded to two outer skin layers

3.1.2.5

bend

rounded transition zone between flat plate elements

3.1.2.6

unstiffened elements

internal or outstand compression elements without stiffeners

3.1.2.7

stiffened elements

compression elements with intermediate or edge stiffeners

3.1.2.8

stiffener

within the context of EN 1993-1-3 the term 'stiffener' without further specification refers to a longitudinal stiffener, i.e. a single fold or succession of folds in the cross-section aimed at increasing the resistance against local buckling/distortional buckling

Note 1 to entry: Longitudinal stiffeners can either be edge stiffeners or intermediate stiffeners.