



**SLOVENSKI STANDARD**  
**SIST EN 1993-1-13:2024**

**01-julij-2024**

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**Evrokod 3 - Projektiranje jeklenih konstrukcij - 1-13. del: Nosilci z velikimi mrežnimi odprtini**

Eurocode 3 - Design of steel structures - Part 1-13: Beams with large web openings

Eurocode 3 - Bemessung und Konstruktion von Stahlbauten - Teil 1-13: Träger mit großen Stegöffnungen

Eurocode 3 - Calcul des structures en acier - Partie 1-13 : Poutres avec grandes ouvertures d'âme

**Ta slovenski standard je istoveten z: EN 1993-1-13:2024**

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**ICS:**

91.010.30	Tehnični vidiki	Technical aspects
91.080.13	Jeklene konstrukcije	Steel structures

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## Eurocode 3 - Design of steel structures - Part 1-13: Beams with large web openings

Eurocode 3 - Calcul des structures en acier - Partie 1-  
13 : Poutres avec grandes ouvertures d'âme

Eurocode 3 - Bemessung und Konstruktion von  
Stahlbauten - Teil 1-13: Träger mit großen  
Stegöffnungen

This European Standard was approved by CEN on 1 January 2024.

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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 1993-1-13:2024 (E)****European foreword**

This document (EN 1993-1-13:2024) 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of an identical text or by endorsement, at the latest by September 2027, and conflicting national standards shall be withdrawn at the latest by March 2028.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.

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.

## 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, 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 1993 series

The EN 1993 series 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.

The EN 1993 series 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;*

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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 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 1993-1-13**

EN 1993-1-13 gives guidance and recommendations for the design of beams with large web openings.

**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 1993-1-13

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 1993-1-13 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 1993-1-13 through notes to the following clauses:

1.1.3(1)                      8.1.2(1)                      8.1.3(2)                      9(5)

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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**EN 1993-1-13:2024 (E)****1 Scope****1.1 Scope of EN 1993-1-13****1.1.1 General**

(1) This document gives supplementary provisions that extend the application of EN 1993-1-1 and EN 1993-1-5 to the design of rolled and welded steel sections with various shapes of web openings. The following cases are considered:

- rolled or welded beams with single or widely spaced web openings;
- rolled or welded beams with closely spaced web openings;
- cellular beams with circular openings made by cutting and re-welding two parts of steel sections that may be different in dimensions;
- beams with hexagonal and sinusoidal openings made by cutting and re-welding two parts of steel sections that may be different in dimensions.

(2) This document applies to uniform members with I or H profiles, which are symmetric about the weak axis. It does not apply to non-prismatic or curved beams although the same principles can apply.

(3) This document applies to steel beams with web openings that are subjected to sagging (positive) or to hogging (negative) bending moments.

(4) This document covers the verification of the resistance at the openings and their effects on the global behaviour of the beam, including lateral torsional buckling.

(5) Alternative methods are presented for beams with circular openings and with sinusoidal openings in which the forces and resistances are calculated by increments around or along the openings and which are suitable for computer methods.

(6) This document applies to web slenderness,  $h_w/t_w$ , not exceeding  $121\varepsilon$ . The local checks at and between adjacent openings apply to web slenderness up to this limit. The material parameter  $\varepsilon$  is defined in EN 1993-1-1:2022, 5.2.5(2).

NOTE The limit of  $121\varepsilon$  is the limit of a Class 4 web for a steel section with equal flanges. It is used as a convenient limit for the application of this document, including mono-symmetric sections.

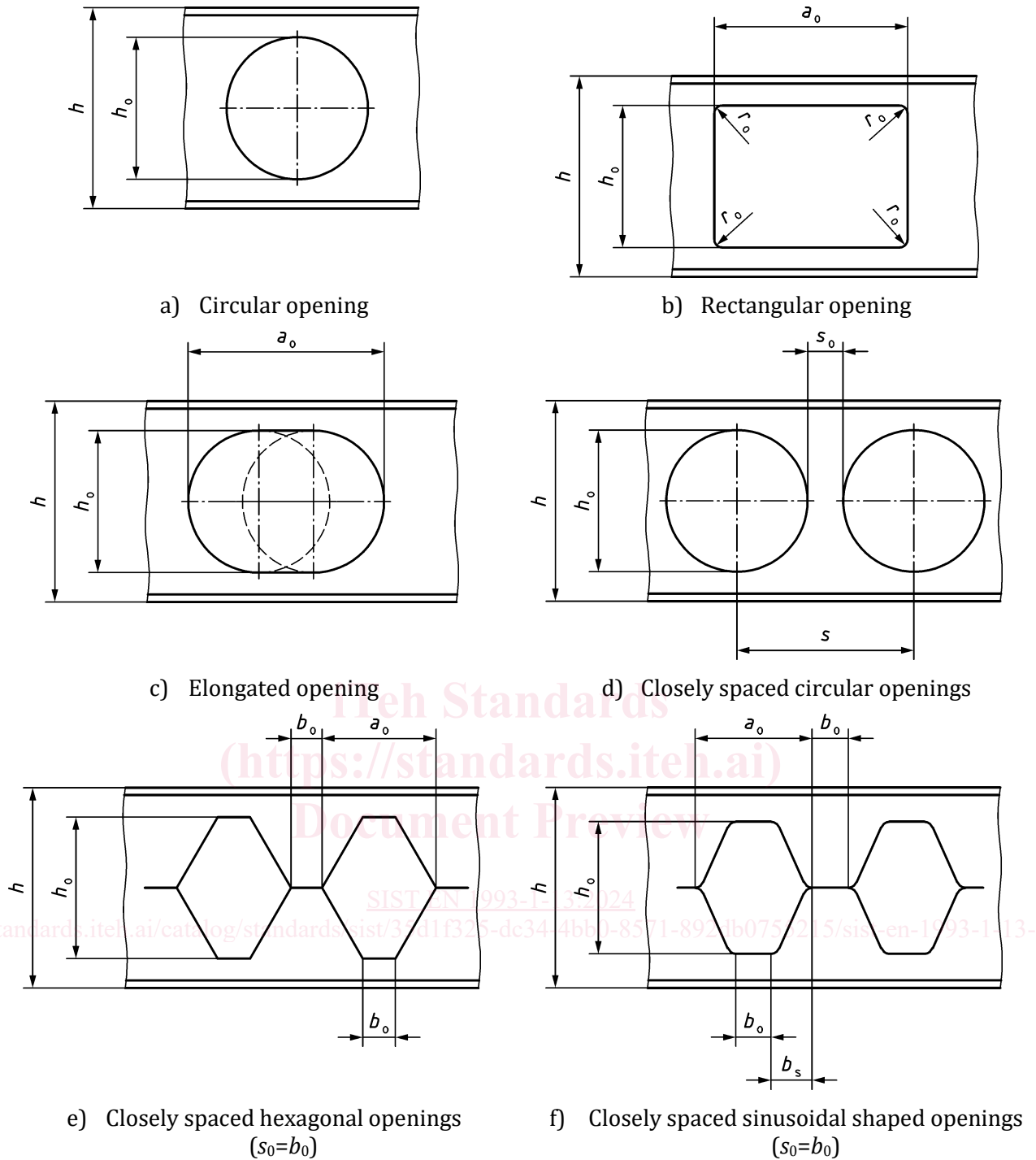
(7) This document does not cover fatigue. In case of fatigue, EN 1993-1-9 applies.

(8) This document does not cover fire design. For the design in case of fire, EN 1993-1-2 applies.

(9) This document does not cover the buckling verification of members with web openings under axial force.

**1.1.2 Shapes of web openings**

(1) The different shapes of web openings that are considered in this document are shown in Figure 1.1.



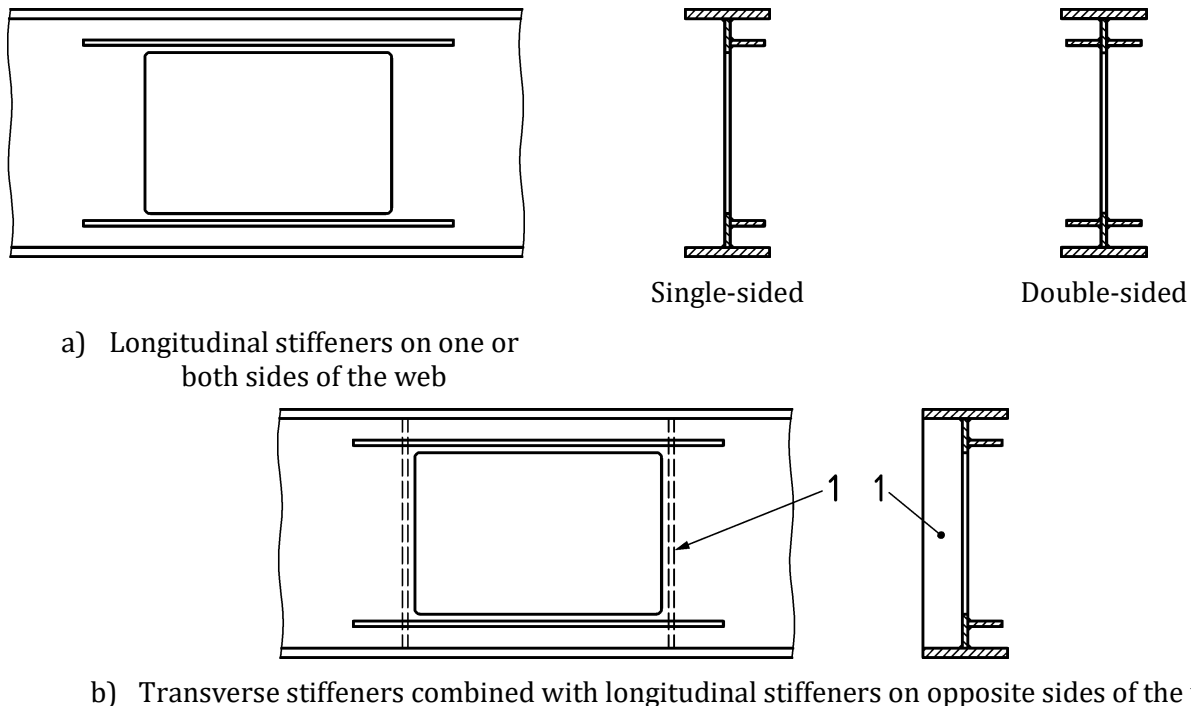
**Figure 1.1 — Different shapes of web openings in steel beams**

### 1.1.3 Stiffened openings

(1) This document also covers openings in the web of beams that are reinforced by longitudinal stiffeners and/or transverse stiffeners on one or both sides of the web, see Figure 1.2.

NOTE The National Annex can give rules for alternative types of stiffener.

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**Key**

1 transverse stiffener

**Figure 1.2 — Stiffening of openings in beam webs****1.2 Assumptions**

(1) Unless specifically stated, EN 1990, the EN 1991 series and EN 1993-1-1 apply.

(2) The design methods given in EN 1993-1-13 are applicable if:

- the execution quality is as specified in EN 1090-2, and
- the construction materials and products used are as specified in the relevant parts of the EN 1993 series, or in the relevant material and product specifications.

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

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

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