SLOVENSKI STANDARD
oSIST prEN 1993-7:2025

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Evrokod 3 - Projektiranje jeklenih konstrukcij - 7.del: Sendvič plošče

Eurocode 3 - Design of steel structures - Part 7: Sandwich panels

Eurocode 3 - Bemessung und Konstruktion von Stahlbauten - Teil 7: Sandwich-Elemente

Eurocode 3 - Calcul des structures en acier - Partie 7 : Panneaux sandwich

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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 7: Sandwich panels

Eurocode 3 - Calcul des structures en acier - Partie 7 : Panneaux sandwich

Eurocode 3 - Bemessung und Konstruktion von Stahlbauten - Teil 7: Sandwich-Elemente

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 250.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 1993-7:2025) 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 document is currently submitted to the CEN Enquiry.

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.

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 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 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, sandwich panels, 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 1993-7

(1) EN 1993-7 gives supplementary design rules for structural systems and self-supporting systems made of sandwich panels. The focus in EN 1993-7 is on design methods and design rules for individual sandwich panels and structural systems comprised of individual sandwich panels regarding resistance, stability and serviceability.

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 1993-7

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

The national standard implementing EN 1993-7 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 document is to be used.

When no national choice is made and no default is given in this document, 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 1993-7 through notes to the following clauses:

4.1(2)	4.2(2)	4.3.1.3(1)	4.4.1(3)
4.4.2(4) — 3 times	4.4.3(2)	5.3.1(3)	7.1.3(1)
7.7(1)	7.9(1)	7.10(1)	8.2.2.1(4) — 2 times
8.2.2.2(3)	8.3.1(2)	8.3.2(2)	9.5(1)

National choice is allowed in EN 1993-7 on the application of the following informative annexes:

Annex A	Annex B	Annex C	Annex D
Annex M			

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 1993-7

(1) This document is applicable for the design of structural or self supporting systems made of sandwich panels with steel faces and core material with a Declaration of Performance (according to EN 14509-1 and EN 14509-2) used as internal and external walls, roofs and ceilings.

1.2 Assumptions

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

(2) The design methods given in EN 1993-7 are applicable if:
- the construction materials and products are as specified in the relevant parts of EN 14509 (all parts), 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. through 'should' clauses) and permissions (i.e. through 'may' clauses).

EN 1990:2023, *Eurocode — Basis of structural and geotechnical design*

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

EN 1993-1 (all parts), *Eurocode 3 — Design of steel structures*

EN 14509 (all parts)[1], *Factory-made double skin metal faced insulating sandwich panels*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14509 (all parts) and the following apply.

3.1.1
bond
adhesion between the face(s) and the core normally provided by an adhesive or by auto-adhesion

3.1.2
ceiling
covering over an internal area

3.1.3
core
layer of material, having thermal insulating properties, which is bonded between two steel faces

[1] At draft stage.

3.1.4
edge
longitudinal edge
side of the panel

3.1.5
face
flat, lightly profiled or profiled steel sheet firmly bonded to the core

3.1.6
flat face
face without any rolled or pressed profiling, or raised strengthening trapezoidal section

3.1.7
global buckling
instability characterized by a translation of the cross-section

Note 1 to entry: Global buckling modes of axially loaded sandwich panels include flexural modes with or without wrinkling of the face under compression.

3.1.8
joint
interface between two panels where the butt edges have been designed so that the panels can be joined in the same plane

Note 1 to entry: The joint can incorporate interlocking parts that enhance the mechanical properties of the system as well as improve the thermal, acoustic and fire performance and restrict air movement.

Note 2 to entry: The term 'joint' does not refer to a junction between cut panels or a junction where the panels are not installed in the same plane.

3.1.9
lightly profiled face
face with a rolled or pressed profiling not exceeding 5 mm in depth

3.1.10
profiled face
face with a rolled or pressed profiling exceeding 5 mm in depth

3.1.11
sandwich panel
building product consisting of two steel faces positioned on either side of a core

Note 1 to entry: The core is firmly bonded to both faces so that the three components act compositely when under load.

3.1.12
structural system
structure consisting of sandwich panels

3.1.13
wrinkling
cross-sectional instability in which the face under compression undergoes out-of-plane plate bending deformations (local buckling)

3.1.14
line loads perpendicular to the span
loads that are applied on the whole width of the panel with a load application length corresponding to the minimum support width L_s according to EN 14509 (all parts)

3.1.15
point loads
loads applied over a width smaller than the whole panel width and/or a length shorter than the minimum support width L_s according to EN 14509 (all parts)

3.2 Symbols and abbreviations

For the purpose of this document the following symbols apply:

3.2.1 Latin upper case symbols

A_C	cross sectional area of the core
A_{Fi}	cross-sectional areas of the faces
A_{F1}, A_{F2}	cross section of the inner and outer steel face
A_O	cross sectional area of the opening
B	panel width
B_{eff}	effective width
$B_{eff,w}$	effective width for bending moment
$B_{eff,v}$	effective width for shear forces
$B_{eff,min}$	minimum effective width for bending and shear respectively
B'_{eff}	reduced effective width
B_S	bending stiffness
C_w	correction factor point loads
C_v	correction factor point loads
F	support reaction
E	modulus of elasticity
$F_{a,plane}$	force in plane
$F_{a,perp}$	force perpendicular to the plane
$F_{a,Rd}$	resistance force of the panels and its assemblies
$F_{a,Ed}$	horizontal seismic force acting on a non-structural element
F_{Ed}	(support reaction) force at ULS/SLS
$F_{t,Rk}$	characteristic tensile resistance of a fastener
$F_{va,Rd}$	dynamic shear capacity of each fastener
$F_{va,Ed}$	seismic shear force of each fastener during the test
$F_{ta,Rd}$	dynamic tension capacity of each fastener
$F_{ta,Ed}$	seismic tension force of each fastener during the test

G_{Cm}	mean shear modulus of the core
G_{Ct}	time dependent shear modulus of the core material
$G_{Ct,eff}$	time and load dependent effective shear modulus of the core considering creep
I_{F1}	second moment of area of the profiled face
L	span, member length, length of specimen tested
L_{cr}	buckling length
L_S	width of support
$L_{S,eff}$	effective width at the support
M_{Ed}	bending moment in the critical cross section caused by eccentricity of normal force and loads perpendicular to the panel
M_S	sandwich bending moment
$N_{cr,S}$	critical buckling load taking into account the shear deformation
N_{Ed}	normal force in the critical cross section at ULS
N_{mt}	normal force caused by medium-term loads (i.e. load duration less than permanent, snow)
N_{pt}	normal force caused by permanent loads
R_G	degree of reflection relative to magnesium oxide = 100 %
S	Shear Stiffness, soil factor as provided by EN 1998-1-1
$(T_1 - T_2)$	thermal gradient
$V_{Fi,Ed}$	design shear force in the considered profiled face in ULS
$V_{Fi,Rd}$	design value of the shear resistance of the considered profiled face
V_S	shear force in the core
$V_{S,Ed}$	design shear force in core in ULS/SLS

3.2.2 Latin lower case symbols

b_e	width of load introduction
d_C	continuous core thickness
e	is the distance of the centroids of the faces
e^*	geometric eccentricity of N_{Ed} at point of load introduction
e_y	distance between load introduction and panel edge
f_y	yield strength of considered face
f_{Cc}	compressive strength of the core
f_{Cv}	shear resistance of the core
$f_{Cv,long}$	reduced long-term shear strength
$f_{Cv,O}$	reduced shear strength due to the opening
f_u	nominal ultimate tensile strength
f_y	nominal yield strength