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Eurocode 7 – Geoteknik – Del 1: Generelle regler

Eurocode 7 – Geotechnical design – Part 1: General rules

DANSK STANDARD
Danish Standards Association

Göteborg Plads 1
DK-2150 Nordhavn

Tel: +45 39 96 61 01
dansk.standard@ds.dk
www.ds.dk

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DS projekt: M362658
ICS: 91.010.30; 93.020

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Denne publikations overensstemmelse er:
IDT med: EN 1997-1:2024

DS-publikationen er på engelsk.

Denne publikation erstatter: DS/EN 1997-1:2007, DS/EN 1997-1/AC:2009, DS/EN 1997-1/A1:2014, DS/EN 1997-1/AC:2010

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EUROPEAN STANDARD EN 1997-1

NORME EUROPÉENNE

EUROPÄISCHE NORM September 2024

ICS 91.010.30; 93.020 Supersedes EN 1997-1:2004

English Version

Eurocode 7 - Geotechnical design - Part 1: General rules

Eurocode 7 - Calcul géotechnique - Partie 1 : Règles générales

Eurocode 7 - Entwurf, Berechnung und Bemessung in der Geotechnik - Teil 1: Allgemeine Regeln

This European Standard was approved by CEN on 7 July 2024.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Ref. No. EN 1997-1:2004: E

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Contents

Page

This is a preview of DS/EN 1997-1:2024. Click here to purchase the full version from the ANSI store.

This is a preview of DS/EN 1997-1:2024. Click here to purchase the full version from the ANSI store.

This is a preview of DS/EN 1997-1:2024. Click here to purchase the full version from the ANSI store.

European foreword

This document (EN 1997-1:2024) 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of an identical text or by endorsement, at the latest by September 2027, and conflicting national standards shall be withdrawn at the latest by March 2028.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.

Together with EN 1990:2023 and EN 1997-3:—[1)], this document supersedes EN 1997-1:2004.

EN 1997-1:2024 includes the following significant technical changes with respect to EN 1997-1:2004:

— the scope of EN 1997-1 has been extended to include rock (the word "ground" is now used extensively to denote soil, rock, and fill);

— the Geotechnical Category has been redefined as a combination of the Consequence Class of the structure and the complexity of the ground (Geotechnical Complexity Class) (Clause 4 and Annex C);

— robustness, durability and sustainability have been introduced as new topics (Clause 4);

— the representative value of a ground property has been defined as either a nominal value (cautious estimate) or a characteristic value (based on statistical evaluation) (Clause 4 and Annex A);

— a new clause on the determination of groundwater levels and groundwater pressures has been added (Clause 6);

— a new procedure for verifying ultimate limit states using numerical models has been added (Clause 8);

— greater emphasis has been given to serviceability limit states, including ground movements and structural and hydraulic aspects (Clause 9);

— a new clause on the implementation of design (covering supervision, inspection, monitoring, and maintenance) has been added (Clause 10);

— a new clause on testing has been added, covering tests for determining ground properties, tests for measuring the resistance of geotechnical structures, product quality tests, and tests to determine geotechnical behaviour (Clause 11); and

— the clause on reporting has been revised to cover updated specification of the Ground Investigation and Geotechnical Design Reports and new requirements for Geotechnical Construction Records and geotechnical test reports (Clause 12 and Annex C).

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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.

1) Under preparation. Stage at the time of publication: prEN 1997-3:2022.

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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.

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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 1997 (all parts)

EN 1997 consists of a number of parts:

— EN 1997-1, *Eurocode 7 — Geotechnical design – Part 1: General rules*

— EN 1997-2, *Eurocode 7 — Geotechnical design – Part 2: Ground properties*

— EN 1997-3, *Eurocode 7 — Geotechnical design – Part 3: Geotechnical structures*

EN 1997 (all parts) establishes additional principles and requirements to those given in EN 1990 (all parts) for the safety, serviceability, robustness, and durability of geotechnical structures.

EN 1997 (all parts) is intended to be used in conjunction with the other Eurocodes for the design of geotechnical structures, including temporary geotechnical structures.

Design and verification in EN 1997 (all parts) are based on the partial factor method or other reliability-based methods, prescriptive rules, testing, or the Observational Method.

0.3 Introduction to EN 1997-1

EN 1997-1 establishes additional principles and requirements to those given in EN 1990 (all parts) for the safety, serviceability, robustness, and durability of geotechnical structures.

Design and verification in EN 1997-1 are based on the partial factor method or other reliability-based methods, prescriptive rules, testing, or the Observational Method.

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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 1997-1

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 1997-1 can have a National Annex containing all national choices to be used for the design of buildings and 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 1997-1 through notes to the following clauses:

4.1.2.2(1)	4.1.2.3(3)	4.1.3(1)	4.1.4(2)
4.1.5(1)	4.1.8(3)	4.2.3.2(2)	4.2.4(3)
4.3.2.3(2)	4.4.1.3(1) – 3 choices	4.4.1.3(9) – 2 choices	4.4.1.5(1) – 2 choices
4.5(1)	4.5(4)	5.4(2)	5.5(2)
5.5(3)	7.1.1(7)	7.2(2)	8.1.4.2(3)
8.2(1) – 2 choices	10.2(3)	12.1(4)	A.4(3)
A.4(8) – 2 choices	A.4(11)	C.3(3)	C.3(4)

National choice is allowed in EN 1997-1 on the application of the following informative annexes:

Annex A	Annex B	Annex C

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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Eurocode 7 – Geotechnical design –

Part 1:
General rules

1 Scope

1.1 Scope of EN 1997-1

(1) This document provides general rules for the design and verification of geotechnical structures.

(2) This document is applicable for the design and verification of geotechnical structures outside the scope of EN 1997-3.

NOTE In this case, additional or amended provisions can be necessary.

1.2 Assumptions

(1) In addition to the assumptions given in EN 1990, the provisions of EN 1997 (all parts) assume that:

— ground investigations are planned by individuals or organisations with knowledge of potential ground and groundwater conditions;

— ground investigations are executed by individuals with appropriate skills and experience;

— the evaluation of test results and derivation of ground properties from the ground investigation are carried out by individuals with appropriate geotechnical experience and qualifications;

— the data required for design are collected, recorded, and interpreted by appropriately qualified and experienced individuals;

— geotechnical structures are designed and verified by individuals with appropriate qualifications and experience in geotechnical design;

— adequate continuity and communication exist between the individuals involved in data collection, design, verification and execution.

(2) This document is intended to be used in conjunction with EN 1990, which establishes principles and requirements for the safety, serviceability, robustness, and durability of structures, including geotechnical structures, and other construction works.

NOTE Additional or amended provisions can be necessary for assessment of existing structures, see EN 1990-2.

(3) This document is intended to be used in conjunction with EN 1997-2, which gives provisions for determining ground properties from ground investigations.

(4) This document is intended to be used in conjunction with EN 1997-3, which gives specific rules for the design and verification of certain types of geotechnical structures.

(5) This document is intended to be used in conjunction with other Eurocodes for the design of geotechnical structures, including temporary geotechnical structures.

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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 (i.e. in 'may' clauses), possibilities (i.e. in 'can' clauses), and in notes.

EN 206, *Concrete – Specification, performance, production and conformity*

EN 1537, *Execution of special geotechnical works – Ground anchors*

EN 1990:2023,[1)] *Eurocode — Basis of structural and geotechnical design*

EN 1991-2:2023, *Eurocode 1 — Actions on structures — Part 2: Traffic loads on bridges and other civil engineering works*

EN 1991-1-1:—,[2)] *Eurocode 1 — Actions on structures — Part 1-1: Specific weight of materials, self-weight of construction works and imposed loads on buildings*

EN 1992-1-1, *Eurocode 2 — Design of concrete structures — Part 1-1: General rules and rules for buildings, bridges and civil engineering structures*

EN 1993-1-10, *Eurocode 3: Design of steel structures — Part 1-10: Material toughness and through-thickness properties*

EN 1993-5, *Eurocode 3 – Design of steel structures — Part 5: Piling*

EN 1995-1-1, *Eurocode 5 — Design of timber structures — Part 1-1: General – Common rules and rules for buildings*

EN 1996 (all parts), *Eurocode 6 — Design of masonry structures*

EN 1997-2:2024, *Eurocode 7 — Geotechnical design — Part 2: Ground properties*

EN 1997-3:—,[3)] *Eurocode 7 — Geotechnical design — Part 3: Geotechnical structures*

EN 1998-1-1, *Eurocode 8 — Design of structures for earthquake resistance — Part 1-1: General rules and seismic action*

EN 12715, *Execution of special geotechnical work — Grouting*

EN 12716, *Execution of special geotechnical work — Jet grouting*

EN 13670, *Execution of concrete structures*

EN 14199, *Execution of special geotechnical works — Micropiles*

EN 14475, *Execution of special geotechnical works — Reinforced fill*

EN 14487 (all parts), *Sprayed concrete*

EN 14490, *Execution of special geotechnical works – Soil nailing*

EN ISO 14688 (all parts), *Geotechnical investigation and testing — Identification and classification of soil*

EN 15237, *Execution of special geotechnical works — Vertical drainage*

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1) As impacted by EN 1990:2023/prA1:2024

2) Under preparation. Stage at the time of publication: FprEN 1991-1-1:2024.

3) Under preparation. Stage at the time of publication: prEN 1997-3:2022.