



STANDARDISERINGEN I SVERIGE
SWEDISH STANDARDS INSTITUTION

SVENSK STANDARD SS-ENV 1991-4

Handläggande organ

Byggstandardiseringen, BST

Fastställt

1997-01-17

Utgåva

1

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Eurocode 1: Grundläggande dimensioneringsregler och laster – Del 4: Last på silor och behållare

Eurocode 1: Basis of design and actions on structures – Part 4: Actions in silos and tanks



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Den europeiska förstandarden ENV 1991-4:1995 gäller som svensk standard och publiceras i form av en svensk försöksstandard, som innehåller den engelska versionen av ENV 1991-4.

Försöksstandarden förutsätter att den tillämpas i kombination med reglerna i ett svenskt anpassningsdokument, NAD, till standarden. Boverket i samråd med Banverket och Vägverket ger ut NAD-dokumentet.

ENV 1991-4 kommer att revideras och delvis omarbetas i samband med att den publiceras som europastandard, EN. Det finns för närvarande inga planer på att översätta försöksstandarden till svenska.

Del 4 av Eurocode 1 är en del av sammanlagt 11 delar för olika typer av laster eller påverkningar.

Enligt 1:5 i Boverkets Konstruktionsregler BKR 94 (BFS 1993:58) godtages metoder och konstruktionslösningar enligt denna försöksstandard som alternativ till sådana som anges i BKR 94, med tillägg och ändringar angivna i tillhörande NAD.

ICS 91.040.00

Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.
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Upplysningar om **sakinnehållet** i standarden lämnas av BST.
Telefon: 08 - 617 74 00. Telefax: 08 - 617 74 30

Prisgrupp R

Tryckt i mars 1997

**EUROPEAN PRESTANDARD
PRÉNORME EUROPÉENNE
EUROPÄISCHE VORNORM**

ENV 1991-4

May 1995

ICS 91.040.00

Descriptors: Civil engineering. structures. design. construction, buildings codes. computation. loads. silos. tanks:containers

English version

**Eurocode 1: Basis of design and actions on structures -
Part 4: Actions in silos and tanks**

Eurocode 1: Bases de calcul et actions sur les structures — Partie 4: Actions dans les silos et réservoirs

Eurocode 1: Grundlagen der Tragwerksplanung und Einwirkungen auf Tragwerke — Teil 4: Einwirkungen auf Silos und Flüssigkeitsbehälter

This European Prestandard (ENV) was approved by CEN on 1993-06-30 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1060 Brussels

ENV 1991-4

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Foreword

Objectives of the Eurocodes

- (1) The Structural Eurocodes comprise a group of standards for the structural and geotechnical design of buildings and civil engineering works.
- (2) They cover execution and control only to the extent that is necessary to indicate the quality of the construction products, and the standard of the workmanship, needed to comply with the assumptions of the design rules.
- (3) Until the necessary set of harmonized technical specifications for products and for methods of testing their performance are available, some of the Structural **Eurocodes** cover some of these aspects in informative annexes.

Background to the Eurocode programme

- (4) The Commission of the European Communities (CEC) initiated the work of establishing a set of harmonized technical rules for the design of building and civil engineering works which would initially serve as an alternative to the different rules in force in the various member states and would ultimately replace them. These technical rules became known as the Structural Eurocodes.
- (5) In 1990, after consulting their respective member states, the CEC transferred the work of further development, issue and updating of the Structural Eurocodes to CEN, and the EFTA secretariat agreed to **support** the CEN work.
- (6) CEN Technical Committee CEN/TC 250 is responsible for all Structural Eurocodes.

Eurocode programme

- (7) Work is in hand on the following Structural Eurocodes, each generally consisting of a number of parts:
 - EN 1991 Eurocode 1: Basis of design and 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 alloy structures

(8) Separate subcommittees have been formed by CEN/TC250 for the various Eurocodes listed above.

(9) This Part of ENV 1991 is being published as European Prestandard ENV 1991-4.

(10) This prestandard is intended for experimental application and for the submission of comments, and a future development is intended to cover greater eccentricities and silos with internal ties.

(11) After approximately two years CEN members will be invited to submit formal comments to be taken into account in determining future actions.

(12) Meanwhile feedback and comments on this prestandard should be sent to the secretariat of CEN/TC250/SC1 at the following address:

SNV / SIA (until end May 1995)
Selnaustrasse 16
CH-8039 ZÜRICH
SWITZERLAND

SIS (from June 1995)
Box 3295
S-103 66 STOCKHOLM
SWEDEN

or to your national standards organization.

National Application Documents (NAD's)

(13) In view of the responsibilities of authorities in member countries for safety, health and other matters covered by the essential requirements of the Construction Products Directive (CPD), certain safety elements in this ENV have been assigned indicative values which are identified by ('boxed values'). The authorities in each member country are expected to review the 'boxed values' and may substitute alternative definitive values for these safety elements for use in national application.

(14) Some of the supporting European or International standards may not be available by the time this Prestandard is issued. It is therefore anticipated that a National Application Document (NAD) giving an substitute definitive values for safety elements, referencing compatible supporting standards and providing guidance on the national application of this Prestandard, will be issued by each member country or its Standards Organization.

(15) It is intended that this Prestandard is used in conjunction with the NAD valid in the country where the building or civil engineering works is located.

(16) The scope of ENV 1991 is defined in clause 1.1.1 and the scope of this part of ENV 1991 is defined in 1.1.2. Additional parts of ENV 1991 which are planned are indicated in clause 1.1.3.

(17) This Part is complemented by a number of informative annexes.

Section 1 General

1.1 Scope

1.1.1 Scope of ENV 1991 - Eurocode 1

(1)P ENV 1991 provides general principles and actions for the structural design of buildings and civil engineering works including some geotechnical aspects and shall be used in conjunction with ENV 1992-1999.

(2) It may also be used as a basis for the design of structures not covered in ENV 1992-1999 and where other materials or other structural design actions are involved.

(3) ENV 1991 also covers structural design during execution and structural design for temporary structures. It relates to all circumstances in which a structure is required to give adequate performance.

(4) ENV 1991 is not directly intended for the structural appraisal of existing construction, in developing the design of repairs and alterations or, for assessing changes of use.

(5) ENV 1991 does not completely cover special design situations which require unusual reliability considerations such as nuclear structures for which specified design procedures should be used.

1.1.2 Scope of ENV 1991-4 Actions on silos and tanks

(1)P This part provides general principles and actions for the structural design of tanks and silos including some geotechnical aspects and shall be used in conjunction with ENV 1991-1 :Basis of Design, other parts of ENV 1991 and ENV 1992-1999.

(2) This part may also be used as a basis for the design of structures not covered in ENV 1992-1999 and where other materials or other structural design actions are involved.

(3) The following limitations apply to the design rules for silos:

- The silo cross section shapes are limited to those shown in figure 1.2;
- Filling involves only negligible inertia effects and impact loads;
- The maximum particle diameter of the stored material is not greater than $0,3 d_c$.

Note: When particles are large compared to the silo wall thickness the load shall be applied as single forcer

- The stored material is free-flowing;