



SLOVENSKI STANDARD
SIST EN 13369:2002
01-september-2002

Skupna pravila za betonske izdelke

Common rules for precast concrete products

Allgemeine Regeln für Betonfertigteile

Règles communes pour les produits préfabriqués en béton

Ta slovenski standard je istoveten z: EN 13369:2001

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ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products
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SIST EN 13369:2002

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EUROPEAN STANDARD

EN 13369

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2001

ICS 91.100.30

English version

Common rules for precast concrete products

Règles communes pour les produits préfabriqués en béton

Allgemeine Regeln für Betonfertigteile

This European Standard was approved by CEN on 24 December 2000.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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EN 13369:2001 (E)**Foreword**

This European Standard has been prepared by Technical Committee CEN/TC 229 "Precast concrete products", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by February 2002, and conflicting national standards shall be withdrawn at the latest by February 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This standard is intended to outline the general common requirements applicable to a large number of precast concrete products manufactured in a factory environment. It will act as a reference standard for other standards to enable a more consistent approach to standardisation in the field of precast concrete products and to reduce the variations brought about by a large number of standards being produced in parallel by different groups of experts. At the same time it allows those experts the flexibility to include variations in specific product standards where they are required.

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This standard has been produced as part of the total CEN programme for construction and is in phase with associated standards EN 206-1 for concrete and ENV 1992 for the design of concrete structures. As it is not a mandated standard it cannot lead to CE marking.

The design of structural products should be verified to ensure the fitness of their properties for the particular application, particular attention being paid to design co-ordination with other parts of the construction.

1 Scope

This European Standard specifies the terminology, requirements, basic performance criteria, test methods and evaluation of conformity that will be referred to by specific product standards unless they are not appropriate. It may also be used to specify products for which there is no standard. Not all of the requirements (clause 4) of this standard are relevant to all precast products.

If a specific precast concrete product standard exists it takes precedence over this standard.

The precast products dealt with in this standard are factory produced for buildings and civil engineering works. This standard may also be applied to products manufactured in temporary plants on site if the production is protected against adverse weather conditions and controlled following clause 6 provisions.

The analysis and design of precast concrete products is not within the scope of this standard but it does offer information about :

- the choice of partial safety factors defined by the Eurocode;
- the rules for applying calculations to high strength concrete ;
- the definition of requirements for prestressed concrete products.

This standard applies to concrete compacted so as to retain no appreciable amount of entrapped air other than entrained air and with a dry density equal to or greater than 800 kg/m³.

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2 Normative references (standards.iteh.ai)

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

2.1 General references

The following references to Eurocodes are references to European Prestandards. These are the only European documents available at the time of publication of this Standard. National documents take precedence until Eurocodes are published as European Standards.

ENV 1991-1:1994, *Eurocode 1 : Basis of design and actions on structures - Part 1 : Basis of design.*

ENV 1992-1-1:1991, *Eurocode 2 : Design of concrete structures - Part 1-1 : General rules and rules for buildings.*

ENV 1992-1-2:1995, *Eurocode 2 : Design of concrete structures - Part 1-2 : General rules - Structural fire design.*

ENV 1992-1-3:1994, *Eurocode 2 : Design of concrete structures - Part 1-3 : General rules - Precast concrete elements and structures.*

ENV 1992-1-6:1994, *Eurocode 2 : Design of concrete structures - Part 1-6 : General rules - Plain concrete structures.*

ISO 1803:1997 , *Building construction – Tolerances - Expression of dimensional accuracy - Principles and terminology.*

EN 13369:2001 (E)**2.2 Concrete**

EN 206-1:2000, *Concrete - Part 1 : Specification, performance, production and conformity.*

EN 12390-2, *Testing hardened concrete - Part 2 : Making and curing specimens for strength tests.*

EN 12390-3¹⁾, *Testing hardened concrete - Part 3 : Compressive strength of test specimens.*

EN 12390-7, *Testing hardened concrete - Part 7 : Density of hardened concrete.*

EN 12504-1, *Testing concrete in structures - Part 1 : Cored specimens - Taking, examining and testing in compression.*

2.3 Steel

EN 10080¹⁾, *Steel for the reinforcement of concrete - Weldable reinforcing steel.*

EN 10138-1¹⁾, *Prestressing steel - Part 1 : General requirements.*

EN 10138-2¹⁾, *Prestressing steel - Part 2 : Stress relieved cold drawn wire.*

EN 10138-3¹⁾, *Prestressing steel - Part 3 : Strand.*

EN 10138-4¹⁾, *Prestressing steel - Part 4 : Hot rolled and processed bars.*

2.4 Production control

ISO 7873, *Control charts for arithmetic average with warnings limits.*

ISO 7966, *Acceptance control charts.*

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ISO 7870, *Control charts - General guide and introduction.*

ISO 8258, *Shewhart control charts.*

2.5 Fire resistance

EN 13501-2¹⁾, *Fire classification of construction products and building elements - Part 2 : Classification using data from fire resistance tests excluding ventilation services.*

ENV 1991-2-2, *Eurocode 1 : Basis of design and actions on structures - Part 2-2 : Actions on structures - Actions on structures exposed to fire.*

ENV 1992-1-2, *Eurocode 2 : Design of concrete structures - Part 1-2 : General rules - Structural fire design.*

¹⁾ Presently under preparation.

2.6 Acoustic insulation

EN ISO 140-3, *Acoustics - Measurement of sound insulation in buildings and of building elements - Part 3 : Laboratory measurements of airborne sound insulation of building elements (ISO 140-3:1995).*

EN ISO 140-6, *Acoustics - Measurement of sound insulation in buildings and of building elements - Part 6 : Laboratory measurements of impact sound insulation of floors (ISO 140-6:1998).*

EN ISO 717-1:1996, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 1 : Airborne sound insulation (ISO 717-1:1996).*

EN ISO 717-2:1996, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 2 : Impact sound insulation (ISO 717-2:1996).*

EN 12354-1, *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 1 : Airborne sound insulation between rooms.*

EN 12354-2, *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 2 : Impact sound insulation between rooms.*

2.7 Thermal resistance

EN 1745²⁾, *Masonry and masonry products - Methods for determining design thermal values.*

EN 1934, *Thermal performance of buildings - Determination of thermal resistance by hot box method using heat flow meter - Masonry.*

EN 12524, *Building materials and products - Hygrothermal properties - Tabulated design values.*

EN 12664, *Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance.*

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EN ISO 6946, *Building components and building elements - Thermal resistance and thermal transmittance - Calculation method (ISO 6946:1996).*

EN ISO 8990, *Thermal insulation - Determination of steady-state thermal transmission properties - Calibrated and guarded hot box (ISO 8990:1994).*

EN ISO 10456:1999, *Building materials and products - Procedures for determining declared and design thermal values (ISO 10456:1999).*

2) Presently under preparation.

EN 13369:2001 (E)**3 Terms and definitions**

For the purposes of this European Standard, the following terms and definitions apply:

In general the term “product” refers to an element which is produced in large numbers.

3.1 General**3.1.1****precast product**

concrete product, that complies with the relevant product standard, and is produced and matured in a place other than its final location in the works

3.1.2**(concrete) cover**

distance between the surface of embedded reinforcement to the nearest concrete surface

3.1.3**design (nominal) cover**

value of the cover quoted in the project documentation

3.1.4**minimum cover**

minimum cover given by the design cover reduced by the tolerance

3.1.5**actual cover**

concrete cover measured on the finished product

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3.2 Dimensions

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3.2.1**principal dimensions**

length, width, depth or thickness

3.2.2**critical dimension**

a dimension having a critical influence on essential performance, such as the product resistance and/or the building stability

3.2.3**work (design) dimension**

the dimension targeted by the manufacturer and compatible with the dimension indicated in the project or in the production documentation

3.2.4**actual dimension**

the dimension found by measurement

3.3 Joints**3.3.1****joint**

any type of interface between adjacent components

3.3.2**structural joint**

any type of connection between products able to transmit forces (e.g. tensile, compressive, flexural or shear forces)

3.3.3**movement joint**

joint that permits relative movement

3.3.4**expansion joint**

movement joint for expansion (e.g. thermal) of the adjacent parts

3.4 Special devices**3.4.1****shear connector**

connection device which transmits shear forces

3.4.2**anchorage (post-tensioned construction)**

device to connect the end of a tendon to the concrete of a structural product and retain the force in the tendon

3.4.3**tie**

tensile reinforcement for the connection of the parts of a structure

3.4.4**fastening**

jointing device used for connecting one part to another

3.5 Supporting elements

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3.5.1**bearing**

support on which precast products are placed [SIST EN 13369:2002](#)

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3.5.2**bearing pad**

element interposed between the supported and the supporting products

3.5.3**mortar bed**

layer of mortar interposed between the supported and the supporting elements

3.6 Tolerances**3.6.1****tolerance**

permitted variation of dimension

[ISO 1803:1997].

3.6.2**deviation**

difference between an actual dimension and the corresponding target (design) dimension

3.6.3**production tolerance**

tolerance on thickness, length, straightness, planarity, or other characteristics during the production of a precast unit

EN 13369:2001 (E)**3.6.4****erection tolerance**

tolerance on local placing, verticality, horizontality, or other characteristics of the construction assembly during installation

3.6.5**construction tolerance**

tolerance in a measure arising from a combination of production, setting out, site work and erection tolerances

3.7 Durability**3.7.1****durability**

ability of a construction or a component to maintain adequate levels of stability and serviceability during its design working life under intended use with anticipated maintenance but without excessive unforeseen maintenance

3.7.2**working life**

the period of time during which the performance of the product in the structure will be kept at a level compatible with the fulfilment of the performance requirements of the structure, provided it is properly maintained

3.7.3**design working life**

value of the working life assumed for the design purposes

3.7.4**environmental condition**

ambient actions on the construction affecting its durability (e.g. : dry, humid with or without frost and possible de-icing agents, seawater with or without frost, slightly or moderately or highly aggressive chemical)

3.8 Mechanical properties

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3.8.1**potential strength (of concrete)**

concrete strength derived from tests on cubes or cylinders conforming to EN 12390-3³⁾ made and cured in laboratory conditions in accordance with EN 12390-2

3.8.2**structural (actual) strength (of concrete)**

concrete strength derived from tests on specimens (drilled cores or cut prisms) extracted from the finished product (direct structural strength) or deduced from tests on standard specimens (as for potential strength) but cured in factory conditions as close as possible to the structural product (indirect structural strength)

3.8.3**characteristic strength**

the value of strength below which 5 % of the population of all possible strength determinations of the volume of concrete under consideration, are expected to fall

3.8.4**design strength (of material)**

value obtained by dividing the characteristic strength by the pertinent partial safety factor

3.9 Reinforcement (of concrete products)**3.9.1****prestressed reinforcement**

prestressing steel (wire, strand or bars) subjected to pre- or post-tensioning

³⁾ Presently under preparation.

3.9.2

reinforcement

steel (bars, wire, strand, welded mesh or fabric, lattice girder) not subjected to pre- or post-tensioning

4 Requirements

4.1 Material requirements

4.1.1 General

Only materials with established suitability shall be used.

For a particular material, the establishment of suitability may result from an European standard which refers specifically to the use of this material in concrete or in concrete products ; it may also result, under the same conditions, from an ISO standard.

Where this material is not covered by an European or ISO standard, or if it deviates from the requirements of these standards, the establishment of suitability may result from :

— the relevant national standards or provisions valid in the place of use of the product which refers specifically to the use of this material in concrete or in products ;

or

— a European Technical approval specifically for the use of this material in concrete or concrete products.

4.1.2 Constituent materials of concrete

EN 206-1:2000, 5.1.2 to 5.1.6 apply.

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4.1.3 Reinforcing steel

Reinforcing steel (bars, coils and welded fabric) shall comply with EN 10080 where applicable.

Other types of reinforcing steel may be used according to relevant National Standards or provisions valid in the place of use of the product, provided they are fit for the intended purpose and have the required properties.

4.1.4 Prestressing steel

Prestressing steel (wire, bars and strand) shall comply with EN 10138 where applicable.

Other types of prestressing steel may be used according to relevant National standards or provisions valid in the place of use of the product.

Information on relaxation of the prestressing steel is given in informative annex C.

4.1.5 Inserts and connectors

Mechanical inserts and connectors shall :

- a) resist the design actions ;
- b) have the necessary ductility ;
- c) maintain these properties for their lifetime.

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4.2 Production requirements

4.2.1 Concrete production

4.2.1.1 General

For concrete composition, type of cement, use of aggregates, additions and admixtures, and for resistance to alkali-silica reaction, chloride content and concrete temperature EN 206-1:2000, 5.2 applies.

When concrete is not specified by the manufacturer EN 206-1:2000, 6.2 or 6.3 applies.

4.2.1.2 Placing and compaction of concrete

Concrete shall be placed and compacted as to retain no appreciable amount of entrapped air other than entrained air and to avoid detrimental segregation.

4.2.1.3 Curing (protection against drying out)

All surfaces of newly cast concrete shall be protected against drying out, by at least one of the methods listed in Table 2, unless it can be shown by tests on the product or otherwise, that no loss in strength or reduced durability or surface cracking will occur in the production environment concerned.

The protection against drying out shall be maintained until the minimum concrete strength (expressed either by the degree of hardening or by the cylinder/cube strength at the end of curing) given in Table 1 is reached.

The concrete strength is measured by testing a concrete sample cured as the product.

The degree of hardening can be measured either by testing a concrete sample or estimated by calculation using a hardening law based on an initial test and maturity concept.

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Table 1 — Minimum concrete strength at the end of protection against drying out

Exposure conditions in the place of use (EN 206-1 exposure classes)		Minimum concrete strength at the end of protection against drying out		
		degree of hardening as % of required strength at 28 days		Cylinder/cube strength N/mm ²
Dry or permanently wet	X0 XC1	only requirement on cylinder/cube strength		12/15
Wet rarely dry Moderate humidity Moderate saturation without deicing agent	XC2, XD2 XC3, XD3 XF1	40	or	16/20
Other exposure conditions		60	or	25/30

Table 2 — Protection against drying out

Method	Typical measure
A - Without addition of water	<ul style="list-style-type: none"> - keeping the concrete in an environment with a relative humidity above 75 % ; - keeping the formwork in place ; - covering the concrete surface with vapour-resistant sheets that are secured at the edges and joints to prevent through draughts.
B - Keep the concrete moist by addition of water	<ul style="list-style-type: none"> - maintaining wet coverings on the concrete surface ; - keeping the concrete surface visibly wet by spraying with water ; - ponding the concrete surface with water.
C - Use of curing compounds	NOTE Effectiveness of this method should be estimated by initial testing showing that the strength reached with curing compounds is of the same order to the strength obtained by one of the above accepted means of curing

4.2.1.4 Accelerated hydration by heat treatment

Where heat treatment at atmospheric pressure is applied to concrete during production in order to accelerate its hardening, it shall be demonstrated by initial testing that the required strength is achieved for each concrete family.

In order to avoid microcracking and/or durability defects, the following conditions shall be fulfilled unless previous positive experience has shown that these requirements are not necessary.

- a proper preheating period shall be applied when heat treatment mean maximum temperature \bar{T} exceeds 40 °C ;
- the temperature differences between adjacent parts of the elements during the heating and the cooling phases shall be limited to 20 °C.

The preheating period and the heating rate shall be documented.

The conditions listed in Table 3 shall be fulfilled.