



SLOVENSKI STANDARD

SIST EN 12839:2012

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Nadomešča:
SIST EN 12839:2002

Betonski izdelki - Elementi za ograje

Precast concrete products - Elements for fences

Betonfertigteile - Betonelemente für Zäune

Produits préfabriqués en béton - Éléments pour clôtures

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Precast concrete products - Elements for fences

Produits préfabriqués en béton - Eléments pour clôtures

Betonfertigteile - Betonelemente für Zäune

This European Standard was approved by CEN on 13 November 2011.

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Foreword

This document (EN 12839:2012) 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of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by October 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12839:2001.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This standard is one of a series of product standards for precast concrete products.

For common aspects reference is made to EN 13369:2004, *Common rules for precast concrete products*, from which also the relevant requirements of EN 206-1, *Concrete — Part 1: Specification, performance, production and conformity*, are taken.

The references to EN 13369:2004 by CEN/TC 229 product standards are intended to make them homogeneous and to avoid repetitions of similar requirements.

Eurocodes are taken as a common reference for design aspects. The installation of some structural precast concrete products is dealt with by EN 13670-1, *Execution of concrete structures*, which has at the moment the status of an European prestandard. In all countries, it can be accompanied by alternatives for national application and it shall not be treated as an European standard.

The programme of standards for structural precast concrete products comprises the following standards, in some cases consisting on several parts:

- EN 1168, *Precast concrete products — Hollow core slabs*;
- EN 12794, *Precast concrete products — Foundation piles*;
- EN 12843, *Precast concrete products — Masts and poles*;
- EN 13224, *Precast concrete products — Ribbed floor elements*;
- EN 13225, *Precast concrete products — Linear structural elements*;
- EN 13693, *Precast concrete products — Special roof elements*;
- EN 13747, *Precast concrete products — Floor plates for floor systems*;
- EN 13978 (all parts), *Precast concrete products — Precast concrete garages*;
- EN 14843, *Precast concrete products — Stairs*;

- EN 14844, *Precast concrete products — Box culverts*;
- EN 14991, *Precast concrete products — Foundation elements*;
- EN 14992, *Precast concrete products — Wall elements*;
- EN 15037-1, *Precast concrete products — Beam-and-block floor systems — Part 1: Beams*;
- EN 15037-2, *Precast concrete products — Beam-and-block floor systems — Part 2: Concrete blocks*;
- EN 15037-3, *Precast concrete products — Beam-and-block floor systems — Part 3: Clay blocks*;
- EN 15050, *Precast concrete products — Bridge elements*;
- EN 15258, *Precast concrete products — Retaining wall elements*.

This standard defines in Annex ZA the application methods of CE marking to products designed using the relevant EN Eurocodes (EN 1992-1-1 and EN 1992-1-2). Where, in default of applicability conditions of EN Eurocodes to the works of destination, design Provisions other than EN Eurocodes are used for mechanical strength, the conditions to affix CE marking to the product are described in ZA.3.4.

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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1 Scope

This European standard specifies precast products in reinforced or pre-stressed concrete with or without fibres, to be used together or in combination with other elements to erect fences e.g. boundary fences.

This European standard covers both mechanical resistance determined by calculation and load bearing capacity determined by testing.

Normal weight concrete or light weight concrete elements include posts, solid or open panels, slabs, rails, spurs, struts and base panels.

The intended uses may be nonstructural or lightly structural.

It provides for the evaluation of conformity of elements to this European Standard. Marking conditions are included.

2 Normative references

The following referenced documents are indispensable for the application 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.

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

EN 1991-1-4:2005, *Eurocode 1: Actions on structures — Part 1-4: General actions — Wind actions*

EN 12390-4:2000, *Testing hardened concrete — Part 4: Compressive strength — Specification for testing machines*

EN 13369:2004, *Common rules for precast concrete products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13369:2004 and the following apply.

3.1

types of fences

NOTE Annex A intends to provide information on the possible types of fences in which these elements may be part of.

3.1.1

solid fence

fence made of posts and solid panels or cladding

3.1.2

open-work fence

fence made of posts and open-work panels possibly including solid panels

3.1.3

mesh or wire fence

fence made of posts and woven or welded wire mesh, and/or wires

3.1.4**mixed fence**

fence made of posts and a combination of different elements with at least one base panel or fence made of load bearing base enclosure walls acting as a base panel and a combination of different (welded) wire meshes

3.1.5**rail fence**

fence made of posts and rails

3.1.6**anti-intruder fence**

mesh fence, solid fence or mixed fence with an enhanced level of security provided by the addition of barbed wire, barbed tape or similar attached to posts with cranked or vertical extensions

3.2**post**

vertical element of reinforced or pre-stressed concrete, intended to be buried or fastened at its base

NOTE This element is designed to accommodate solid or open-work panels and/or rails, meshes or wires.

3.2.1**intermediate post**

post used in the fence line, interposed between ends, direction changes and straining points (if any)

3.2.2**accessory post**

post shaped and designed to provide a particular function

3.2.2.1**corner post**

post used at a change of direction

3.2.2.2**end post**

post used at the extremity of a fence line

3.2.2.3**straining post**

post from which tension wires are stretched, with or without struts (e.g. end-straining post, corner post, intermediate straining post)

3.2.2.4**gate post**

post used to support a gate

3.3**rail**

horizontal element of reinforced or pre-stressed concrete, connected to and supported by the post

NOTE Rails for sports grounds are distinguished from other types of rails.

3.4**panel**

horizontal element of reinforced or pre-stressed concrete, connected to the post

3.4.1**solid panel**

panel of reinforced concrete

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EN 12839:2012 (E)**3.4.2****open-work panel**

panel with regular or varied open-work patterns

3.4.3**base panel**

panel of reinforced concrete used between posts at ground level

3.5**spur**

short post intended to support a fence post made with a material other than concrete

3.6**strut**

element designed to provide support to post carrying horizontal loads

3.7.**dimension**

dimension specified by the manufacturer and generally complying with the dimension indicated in the project or in the manufacturer technical documentation

NOTE 1 The design height of the posts for solid fences is the height of the solid part of the fence.

NOTE 2 The design height of the anti-intruder fence is equal to the height of the post without cranked or vertical extension.

3.8**surface finish**

Finishes are classified as one of two categories corresponding to the different manufacturing techniques detailed below.

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3.8.1**surface finish as cast**

surface finish obtained at demoulding, if necessary after surfacing or finishing

3.8.2**surface finish treated**

surface finish obtained after complementary treatment on the concrete in fresh state or in hardened state

3.9**heat treatment**

The process of heating the fresh concrete in order to accelerate cement hydration where the temperature of the concrete after compaction is above 45 °C or is in excess of 25 °C above the ambient temperature

3.10**normal weight concrete**

3.1.7 of EN 206-1:2000 shall apply

3.11**lightweight concrete**

3.1.8 of EN 206-1:2000 shall apply

4 Requirements**4.1 Material requirements**

4.1 of EN 13369:2004 shall apply:

4.2 Production requirements

4.2.1 Concrete production

4.2.1 of EN 13369:2004 shall apply, with the following complementary requirements.

However, where instant demoulding of elements is required, they may be produced using a concrete mix of water content and workability suitable for the purpose.

4.2.2 Hardened concrete

4.2.2.1 Compressive strength

For fence elements designed by calculation in durability class 1, 4.2.2.1 of EN 13369:2004 shall apply. In other cases, the following shall apply.

Under the test conditions defined in 5.5, the characteristic compressive strength of concrete for the fractile 0,05 ¹⁾, after a 28 days hardening, shall be at least equal to the following values (cylinder/cube):

- light-weight reinforced concrete LC25/28;
- reinforced concrete C35/45;
- pre-stressed concrete C40/50.

Moreover, no specimen shall have a compressive strength less than 0,8 times the characteristic value.

4.2.3 Structural reinforcement

The length of the longitudinal reinforcement for posts shall not be less than the length of the element minus 100 mm.

4.3 Finished product requirement

4.3.1 Geometrical properties

4.2.3.2.3 of EN 13369:2004 shall apply.

4.3.1.1 Production tolerances

The dimensions of the elements are not fixed. If not otherwise stated class D1 applies to all elements.

4.3.1.1.1 Class D.1

The following tolerances shall apply.

Under the test conditions defined in 5.1, actual dimensions shall conform to the corresponding work dimensions within the following limits:

a) posts:

- | | |
|-----------|------------|
| 1) length | $\pm 1 \%$ |
|-----------|------------|

1) This means that statistical interpretation of the tests results demonstrate that 95 % of the corresponding production are at least equal to the values defined above.

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- | | |
|-----------------------------|--------------------|
| 2) cross-section dimensions | $\pm 3 \text{ mm}$ |
| 3) straightness | $\leq 0,5 \%$ |
| 4) location of holes | $\pm 5 \text{ mm}$ |
- b) rails:
- | | |
|------------------------------|--------------------|
| 1) length (between supports) | $\pm 5 \text{ mm}$ |
| 2) cross-section dimensions | $\pm 3 \text{ mm}$ |
| 3) straightness | $\leq 0,5 \%$ |
- c) panels:
- | | |
|---------------|---|
| 1) length | $\pm 5 \text{ mm}$ |
| 2) height | $\pm 3 \text{ mm}$ |
| 3) thickness | $\pm 2 \text{ mm}$ |
| 4) squareness | difference between diagonals: $\leq 0,5 \%$ of their effective mean value |
| 5) flatness | $\leq 0,2 \%$ of the length |

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4.3.1.1.2 Class D2

The following tolerances shall apply.

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The producer shall declare the key-dimension for which the dimensional tolerances shall conform to Table 1.

Table 1 — Dimensional tolerances depending on the key-dimension

Key dimension	Permitted deviation
≤ 1 m	± 5 mm
> 1 m	± 10 mm

4.3.1.2 Minimum dimensions

For pre-stressing wires of diameter d expressed in mm the minimum concrete cover to the surface of any wire shall be $2,5 d$ or 10 mm whichever is the greater. The minimum spacing between wires shall be $4 d$ centre to centre.

4.3.2 Surface characteristics**4.3.2.1 Surface finish as cast**

The maximum total surface area of blowholes is declared by the manufacturer.

NOTE Reference images to identify the severity of blow holes in concrete surfaces could be referred to the guidelines CEN/TR 15739.

4.3.2.2 Instant demoulded product

The surface finish of instant demoulded product shall be defined and agreed between the producer and the purchaser.

4.3.2.3 Ends of the elements

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For pre-stressed elements the ends of the wires shall be flushed with the visible parts of the elements, then coated with a waterproofing product provided there is adequate data on its durability.

Top ends of reinforced posts shall be shaped to allow water run-off.

4.3.2.4 Interlocking surfaces

Interlocking surfaces shall have no flaw or burr which could hinder the assembly of the elements.

For interlocking units in particular, tolerances shall be declared by the manufacturer and shall be such as to permit interlocking.

4.3.3 Mechanical resistance**4.3.3.1 General**

For elements for fences either the mechanical resistance determined by calculation following 4.3.3.2 of EN 13369:2004 or the load bearing capacity determined by testing following Annex B of this standard shall be declared.

4.3.3.2 Complementary load bearing capacity**4.3.3.2.1 General**

For elements designed by testing, the complementary load bearing capacity is the ability of an element to resist a defined load under service conditions and a defined failure load.

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An element shall withstand a complementary load bearing capacity corresponding to:

- its minimum failure load or, for posts, its normal service and failure loads;
- in the case of posts for solid fences, the class of post in relation with wind under end use conditions, when tested in accordance with Annex B.

4.3.3.2.2 Basis of the requirements for mechanical properties

The requirements for mechanical properties of the elements (Tables 3 to 11) are based on:

- a) a maximum above-ground height equal to 2,50 m (excluding extensions for barbed wires);
- b) a centre to centre distance between posts of:
 - 1) 2 m for solid fences and rails for sports grounds;
 - 2) 3 m for mesh or wire fences;
 - 3) 2,5 m for other types of fences;
- c) wind actions for posts for solid fences:
 - 1) the peak velocity pressure at height z , which includes mean and short term velocity fluctuations, should be determined according to EN 1991-1-4 (see Table 2).

For different fence heights or post centres, properties shall be determined by interpolation.

Table 2 — Examples of basic wind velocity for posts for solid fences

Basic wind velocity	
km/h	$V_{b,0}^a$ m/s
80	22
87	24
95	26
100	28
120	33
140	39
^a According to § 4.2 of EN 1991-1-4:2005.	

4.3.3.2.3 Mechanical resistance of posts

Under the test conditions defined in Annex B, posts shall meet the following requirements:

- a) at the limit of working conditions: after release of the normal service load (Tables 3 to 7) the deflection shall not exceed 1 % of the element's above-ground length, and any cracks shall be closed;
- b) at the ultimate limit state: the failure load shall be at least equal to the value of the normal failure load (Tables 3 to 7) for the fractile 0,05 ²⁾.

²⁾ This means that statistical interpretation of the tests results demonstrates that 95 % of the corresponding production are at least equal to the specification.

Moreover, no post shall have a failure load of less than 0,8 times the normal failure load.

NOTE It is recommended that posts for solid fences of at least class B should be used on the sea front or in exposed areas. Local provisions valid in the place where the fence is to be erected should be considered.

For a straining post or "for straining posts", the requirements of 4.3.3.2.2 according to the mechanical resistance apply.

For dimensions which exceed those indicated in the tables, the required mechanical properties shall be defined individually.

The values of loads for intermediate posts are:

Table 3 — Intermediate posts for solid fences (service load)

	Normal failure load N			
Above-ground height of the slabs m	1,00	1,50	2,00	2,50
Class of post ^a				
A	1 400	1 400	1 800	2 200
B	1 400	1 800	2 500	3 100
C	1 400	2 300	3 200	4 000

^a In relation with wind pressures (see EN 1991-1-4).

Table 4 - Intermediate posts for solid slabs fences (failure load)

	Normal failure load N			
Above-ground height of the slabs m	1,00	1,50	2,00	2,50
Class of post ^a				
A	2 300	2 300	3 200	4 000
B	2 300	3 200	4 500	5 600
C	2 600	4 100	5 700	7 200

^a In relation with wind pressures (see EN 1991-1-4).

Table 5 — Intermediate posts for open-work fences and posts for mixed fences with a height of the solid part longer than 900 mm

Above-ground height of panels m	≤ 1,20	1,50	2,00	2,50
Normal service load N	1 400	1 400	1 800	2 200
Normal failure load N	2 300	2 300	3 200	4 000

Table 6 — Intermediate posts for mesh or wire fences and posts for mixed fences with a height of the solid part lower or equal to 900 mm

Above-ground height of posts m	≤ 1,20	1,50	2,00	2,50
Normal service load N	1 400	1 400	1 400	1 400
Normal failure load N	2 100	2 100	2 100	2 100