SLOVENSKI STANDARD
SIST EN 13978-1:2005

01-junij-2005

Montažni betonski izdelki – Montažne betonske garaže – 1. del: Zahteve za armirane monolitne garaže ali garaže, sestavljene iz posameznih montažnih delov garažnih dimenzij

Precast concrete products - Precast concrete garages - Part 1: Requirements for reinforced garages monolithic or consisting of single sections with room dimensions

Betonfertigteile - Betonfertiggaragen - Teil 1: Anforderungen an monolithische oder aus raumgroßen Einzelteilen bestehende Stahlbetongaragen

Produits préfabriqués en béton - Garages préfabriqués en béton - Partie 1: Exigences pour garages en béton armé monolithiques ou composés d'éléments individuels de la dimension d'une piece

Ta slovenski standard je istoveten z: **EN 13978-1:2005**

ICS:

91.090	Konstrukcije zunaj stavb	External structures
91.100.30	Beton in betonski izdelki	Concrete and concrete products

SIST EN 13978-1:2005 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13978-1

May 2005

ICS 91.090; 91.100.30

English version

Precast concrete products - Precast concrete garages - Part 1: Requirements for reinforced garages monolithic or consisting of single sections with room dimensions

Produits préfabriqués en béton - Garages préfabriqués en béton - Partie 1 : Exigences pour garages en béton armé monolithiques ou composés d'éléments individuels de la dimension d'une pièce

Betonfertigteile - Betonfertiggaragen - Teil 1: Anforderungen an monolithische oder aus raumgroßen Einzelteilen bestehende Stahlbetongaragen

This European Standard was approved by CEN on 24 February 2005.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

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

Ref. No. EN 13978-1:2005: E

Contents

Page

The numbering of clauses is strictly related to EN 13369:2004 Common rules for precast concrete products, at least for the first three digits. When a clause of EN 13369 is not relevant or included in a more general reference of this document, its number is omitted and this may result in a gap on numbering.

Foreword

This document (EN 13978-1:2005) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR, and was examined by and agreed with a joint working party appointed by the Liaison Group CEN/TC 229-TC 250, particularly for its compatibility with structural Eurocodes.

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 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 November 2005, and conflicting national standards shall be withdrawn at the latest by February 2007.

This document 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 products*, from which also the relevant requirements of the EN 206 - *Concrete — Part 1: Specification, performances, 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 ENV 13670-1: *Execution of concrete structures — Part 1: Common rules*, 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:

— prEN 1168, *Precast concrete products — Hollow core slabs*.

— EN 12794, *Precast concrete products — Foundation piles*.

— EN 12843, *Precast concrete products — Masts and poles*.

— prEN 13747, *Precast concrete products — Floor plates for floor systems*.

— prEN 15037-1, *Precast concrete products - Beam-and-block floor systems - Part 1: Beams* .

— prEN 15037-2, *Precast concrete products - Beam-and-block floor systems - Part 2: Blocks.*

— EN 13224, *Precast concrete products — Ribbed floor elements*.

— EN 13225, *Precast concrete products — Linear structural elements*.

— prEN 14992, *Loadbearing wall and facades*.

— prEN 15258, *Retaining wall elements*.

— EN 13693, *Precast concrete products — Special roof elements*.

— prEN 14844, *Precast concrete products — Box culverts*.

— prEN 13978, *Precast concrete products — Precast concrete garages*.

— prEN 14991, *Precast concrete products — Foundation elements*.

— prEN 15050, *Precast concrete bridge elements*.

— WI00229019, *Precast concrete products — Silos*.

— prEN 14843, *Precast concrete products — Stairs*.

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

Introduction

This document is Part 1 of the European Standard which consists of two parts:

— Part 1: "Requirements for reinforced garages monolithic or consisting of single sections with room dimensions" refers to precast concrete garages reinforced by bars or fabric;

— Part 2: "Requirements for steel fibre concrete garages" refers to precast garages produced of steel fibre concrete.

Part 1 contains 2 normative and 5 informative annexes.

Annex A (informative) contains recommendations regarding the concrete cover. Annex A is recommended for use if there are no national regulations standing in the way.

Annex B (normative) contains inspections schemes for carrying out the factory production control.

Annex C (informative) specifies simplified design rules for garages. These rules may be used if there are no national rules standing in the way. For garage boxes for basement garages, the applicability of Annex C is restricted (see C.1).

Annex D (normative) contains the initial tests to be carried out.

Annex E (informative) gives information about garage boxes for basement garages for which the resistance to parametric fire is ensured. The chosen fire load for the parametric fire represents the most unfavourable case of a burning car with regard to the energy release rate and the fire duration.

Garages dealt with in Part 1 allow smaller cover than accepted in EN 13369 and EN 1992-1-1. Hence the product is a separate class. This can be accepted due to the generally low stresses in the structure and that after 50 years of use no detrimental effects have been observed.

The evaluation of conformity given in this standard refers to the completed garages which are supplied to the market and covers all the production operations carried out in the factory.

1 Scope

This document regards precast reinforced concrete garages produced as monolithic units or as kits of single sections with room dimensions in stationary factories. These garages are intended to be erected on foundations designed by others and complying with the behaviour of the precast units. They may be free-standing, or may have backfilling behind some of the walls (earthfilled), or earth covered or built over with a parking area for cars or a second storey of precast garages. This document also applies to supplementary units, kits for double space garages and multiple parking garages as well as for garage boxes for one-storey basement garages. It does not apply to elements incorporated as a structural part of an upper structure unless they are designed according to EN 13369.

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 1992-1-1:2004, *Eurocode 2: Design of concrete structures — Part 1-1: General rules and rules for buildings*

EN 1992-1-2:2005, *Eurocode 2: Design of concrete structures — Part 1-2: General rules – Structural fire design*

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

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

3 Terms and definitions

For the purposes of this document, the following terms, definitions and symbols apply. In general the term "product" refers to an element which is produced in large numbers. For general terms see Clause 3 of EN 13369:2004.

3.10 Special definitions for garages

3.10.1
precast reinforced concrete garage
monolithic or as a kit of single sections with room dimensions prefabricated garage made of reinforced concrete

3.10.2
monolithic garage
garage forming a spatial load bearing system

3.10.3
double space garage
kit of two garage boxes situated side by side which are open at every adjoining side

3.10.4
double-deck garage
kit of two garage boxes arranged in two levels one on top of the other

3.10.5
multiple parking garage
garage with increased height suitable for the installation of lifting devices for parking of several vehicles one on top of the other

3.10.6
supplementary unit
annex on a garage, e.g. as room for tools or for lengthening of the parking-space

3.10.7
free-standing garage
garage with the floor level being situated maximum 0,5 m below the surrounding soil

3.10.8
garage with earth-filled walls
garage, in which the height of surrounding soil above the floor level is between 0,5 m and the height of the wall

3.10.9
soil-covered garage
garage covered with a layer of soil

3.10.10
garage box for a basement garage
garage box foreseen as a construction member of an one-storey basement garage which is soil-covered or arranged under a building

3.10.11
tapered wall
wall with a thickness which becomes smaller either along the wall height or along the wall length

3.11 Symbols

Latin upper case letters

A	area of a cross-section
A_s	cross sectional area of reinforcement
H	garage height
L	garage length
N	axial force
T	time
W	garage width

Latin lower case letters

b	width of a cross-section
c	concrete cover
f	strength
h	height of a cross-section
t	thickness of a cross-section
u	axis distance

Greek letters

Δ	deviation

λ slenderness

λ_{ah} coefficient for earth pressure

Indices

a active

c concrete

d design value

eq equal

f floor slab

fl frame leg

h horizontal

nom nominal

p principal (for dimensions)

r roof

sp spanning member

w wall

4 Requirements

4.1 Material requirements

For general aspects, constituent materials of concrete, reinforcing steel, inserts and connectors the relevant clauses of EN 13369:2004, 4.1 (except 4.1.4) shall apply. In particular the ultimate tensile and tensile yield strength of steel shall be considered.

4.2 Production requirements

For concrete production, hardened concrete and structural reinforcement, the relevant clauses of EN 13369:2004 4.2 shall apply, with the following additional requirements. In particular the compressive strength of concrete shall be considered.

4.2.2 Hardened concrete

4.2.2.1 General

The potential strength shall be used. For initial test for the accelerated hardening, reference shall be made to Annex D.

4.2.2.2 Minimum strength class of concrete

The minimum strength class of the concrete as defined in EN 206-1 shall be chosen in dependence on the minimum nominal wall thickness class according to 4.3.1.2 as given in Table 1.

Table 1 — Minimum strength class of concrete in dependence on the minimum nominal wall thickness class

Class	Minimum nominal wall thickness class according to 4.3.1.2	Minimum strength class of concrete as defined in EN 206-1
1	1	C25/30, LC25/28
2	2	C30/37, LC30/33
3	3	C35/45, LC35/38

4.2.3 Structural reinforcement

For monolithic free-standing garages and those parts of monolithic garages with earth-filled walls not exposed to earth-pressure with a roof load (without self-weight of the roof) ≤ 4 kN/m^2, wire fabrics made of indented wire or bars ∅ 4 and ∅ 4,5 may be used. The minimum main reinforcement shall not be less than ∅ 4 with a maximum distance of the reinforcing bars of 150 mm.

For all other garages, 4.3.3.2 of EN 13369:2004 shall apply.

4.3 Finished product requirements

4.3.1 Geometrical properties

4.3.1.1 Production tolerances

EN 13369:2004 4.3.1.1 shall apply. The permitted deviation of the position of openings is ± 20 mm. The minimum cover is given in Annex A.

4.3.1.2 Minimum dimensions

The minimum nominal thickness of walls shall agree with one class given in Table 2. For massive floor plates the minimum nominal thickness shall be 70 mm. Floor plates with other designs (e.g. waffle plates) shall have at least an equal bending stiffness to a massive floor plate with minimum nominal thickness.

The thickness of the floor plate may be reduced up to 60 mm if an equal rigidity is reached by special measures (e.g. special concrete quality).

Table 2 — Minimum nominal wall thickness

Class	Minimum nominal wall thickness
1	100 [a]
2	60 [a]
3	50 [b]
[a] For tapered walls the given values apply to the mean value of the nominal wall thickness with a maximum reduction of 10 mm on the thinnest cross section. [b] Not for tapered walls. The proof for second order effects shall be done according to 5.8.3 of EN 1992-1-1:2004.	

The given minimum dimensions refer to mechanical resistance and durability of garages. If, for a required resistance to fire, larger dimensions are necessary, the larger values shall apply.

4.3.2 Surface characteristics

Annex J of EN 13369:2004 shall apply.

4.3.3 Mechanical resistance

4.3.3.1, 4.3.3.2 and 4.3.3.5 of EN 13369:2004 shall apply, with the following additional requirements.

4.3.3.1 General

In particular resistance to horizontal and vertical loads and the resistance to impact of vehicles at very low speed (accidental action) shall be considered.

For accidental action see 4.3.3.2.

For the other actions the simplified design rules given in Annex C may be used.

4.3.3.2 Mechanical resistance against accidental action

To consider the impact of vehicles with very low speed, it shall be shown by calculation that a horizontal force of 10 kN acting 0,5 m above the floor level on a door pile or on the back wall of the garage (distributed on a width of 1 m), respectively, does not affect the load bearing capacity of the garage as a whole. Local damages are permissible.

4.3.4 Resistance and reaction to fire

4.3.4.1 Resistance to fire

4.3.4.1, 4.3.4.2 and 4.3.4.3 of EN 13369:2004 shall apply.

NOTE For resistance to parametric fire, the information regarding the special features of fires in basement garages erected of garage boxes is given in Annex E.

4.3.4.2 Reaction to fire

4.3.4.4 of EN 13369:2004 shall apply.

4.3.5 Acoustic properties

For sound insulation properties 4.3.5 of EN 13369:2004 shall apply.

4.3.6 Thermal properties

No requirements.

4.3.7 Durability

4.3.7 of EN 13369:2004 shall apply. Additional information about the concrete cover is given in Annex A.

The crack width shall not exceed 0,4 mm.

4.3.8 Other requirements

4.3.8.1 Safety in handling

4.3.8.1 of EN 13369:2004 shall apply.