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Montažni betonski izdelki - Bistvene značilnosti

Precast concrete products - Essential characteristics

Betonfertigteile - Wesentliche Merkmale

Produits préfabriqués en béton - Caractéristiques essentielles

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Betonfertigteile - Wesentliche Merkmale

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 229.

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European foreword

This document (prEN 17808:2022) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document identifies the essential characteristics of precast concrete products and specifies the procedures for assessment and verification of constancy (AVCP) of performance.

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

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

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Introduction

This document was written in answer to standardization request M/100 given to CEN by the European Commission and the European Free Trade Association. It merges and supersedes the corresponding clauses and annexes of the following standards, and is the harmonized technical specification for the declaration of performance of the products covered by their scope:

EN 1168:2005+A3:2011, *Precast concrete products – Hollow core slabs*

EN 12737:2004+A1:2007, *Precast concrete products – Floor slats for livestock*

EN 12794:2005+A1:2007, *Precast concrete products – Foundation piles*

EN 12839:2012, *Precast concrete products – Elements for fences*

EN 12843:2004, *Precast concrete products – Masts and poles*

EN 13224:2011, *Precast concrete products – Ribbed floor elements*

EN 13225:2013, *Precast concrete products – Linear structural elements*

EN 13693:2004+A1:2009, *Precast concrete products – Special roof elements*

EN 13747:2005+A2:2010, *Precast concrete products – Floor plates for floor systems*

EN 13978-1:2005, *Precast concrete products – Precast concrete garages*

EN 14843:2007, *Precast concrete products – Stairs*

EN 14844:2006+A2:2011, *Precast concrete products – Box culverts*

EN 14991:2007, *Precast concrete products – Foundation elements*

EN 14992:2007+A1:2012, *Precast concrete products – Wall elements*

EN 15037-1:2008, *Precast concrete products – Beam-and-block floor systems – Part 1: Beams*

EN 15037-2:2009+A1:2011, *Precast concrete products – Beam-and-block floor systems – Part 2: Concrete blocks*

EN 15037-3:2009+A1:2011, *Precast concrete products – Beam-and-block floor systems – Part 3: Clay blocks*

EN 15037-4:2010+A1:2013, *Precast concrete products – Beam-and-block floor systems – Part 4: Expanded polystyrene blocks*

EN 15037-5:2013, *Precast concrete products – Beam-and-block floor systems – Part 5: Lightweight blocks for simple formwork*

EN 15050:2007+A1:2012, *Precast concrete products – Bridge elements*

EN 15258:2008, *Precast concrete products – Retaining wall elements*

EN 15435:2008, *Precast concrete products — Normal weight and lightweight concrete shuttering blocks — Product properties and performance*

EN 15498:2008, *Precast concrete products — Wood-chip concrete shuttering blocks — Product properties and performance*

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1 Scope

This document identifies the essential characteristics of precast concrete products made of reinforced or prestressed normal weight or light weight concrete, used for the frame, foundation, floors, walls, stairs and roofs of building and civil engineering works, and for garages, boundary fences, masts and poles.

This document also covers blocks made of other materials than concrete and intended to be used in concrete beam-and-blocks floor systems.

This document specifies procedures for assessment and verification of constancy (AVCP) of performance of characteristics of those elements.

This document does not cover the following concrete products:

- Masonry and ancillary products,
- Lighting columns and spigots,
- Roof covering products for discontinuous laying,
- Chimney components,
- Products for wastewater treatment,
- Prefabricated reinforced components of autoclaved aerated concrete or light-weight aggregate concrete with open structure,
- Paving units and kerbs,
- Road equipment,
- Elements made with concrete containing more than 1 % of homogeneously distributed organic material, by mass or by volume (whichever is the most onerous).

This document does not cover the design, production, handling, installation of the elements and the water tightness of joints between elements.

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.

EN 206:2013+A2:2021, *Concrete - Specification, performance, production and conformity*

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

EN 1992-1-2:2004,² *Eurocode 2: Design of concrete structures — Part 1-2: General rules — Structural fire design*

EN 12390-4:2019, *Testing hardened concrete - Part 4: Compressive strength - Specification for testing machines*

EN 12390-7:2019, *Testing hardened concrete — Part 7: Density of hardened concrete*

prEN 13369:2022, *Common rules for precast concrete products*

EN 13501-1:2018, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 13501-2:2016, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13823:2020, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

EN ISO 11925-2:2020, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)*

EN ISO 12572:2016, *Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method (ISO 12572:2016)*

¹ As impacted by EN 1992-1-1:2004/AC:2010 and EN 1992-1-1:2004/A1:2014.

² As impacted by EN 1992-1-2:2004/AC:2008 and EN 1992-1-2:2004/A1:2019.

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1992-1-1:2004 and prEN 13369:2022 and the following apply.

3.1

expression method (for mechanical strength and resistance to fire)

method chosen to express the product performance for mechanical strength and resistance to fire through a description and a reference to a product documentation, using one of the following possibilities:

- a) Method 1: declaration of geometrical data and material properties, with reference to a product documentation,
- b) Method 2: declaration of geometry, material properties and product properties determined following this standard and EN Eurocodes,
- c) Method 3a: declaration of product compliance with reference to a given design specification provided by the client,
- d) Method 3b: declaration of product compliance with reference to a given design specification provided by the manufacturer according to the client's order

Note 1 to entry: These methods do not apply to other essential characteristics.

3.2

design specification

set of documents related to the design of the product containing relevant information (e.g., calculation sheets, drawings ...) taking into account the applicable expression method with the objective of declaring the corresponding performance

4 Characteristics

4.1 Compressive strength of concrete

When assessed, the characteristic value of the compressive strength of normal weight concrete or lightweight concrete shall be determined according to 5.1.

The performance, in the form of the characteristic value, shall be expressed as indication of the value in MPa, rounded to the unit.

4.2 Ultimate tensile and tensile yield strength of steel

4.2.1 Reinforcing steel

When assessed, the ultimate tensile strength and tensile yield strength of reinforcing steel shall be determined according to 5.2.1 and expressed as follows:

- ultimate tensile strength: characteristic value in MPa,
- tensile yield strength: characteristic value in MPa.

4.2.2 Prestressing steel

When assessed, the ultimate tensile strength and tensile 0,1 % proof-stress of prestressing steel shall be determined according to 5.2.2 and expressed as follows:

- ultimate tensile strength: characteristic value in MPa,
- tensile 0,1 % proof-stress: characteristic value in MPa.

4.3 Dimensioning

When assessed, the dimensioning of stairs shall be expressed as geometrical data and shall be determined according to 5.3.

4.4 Permeability

4.4.1 Water vapour permeability

When assessed, the water vapour permeability of external walls and cladding elements shall be expressed as permeance in $\text{kg}/(\text{m}^2 \cdot \text{s} \cdot \text{Pa})$ and determined according to 5.4.1.

4.4.2 Water permeability

When assessed, the water permeability of external walls and cladding elements shall be expressed as a water absorption ratio in % and determined according to 5.4.2.

4.5 Rigidity of joints

When assessed, the rigidity of joints of foundation piles shall be expressed as class and relevant capacity values according to Table 1 and determined according to 5.5.

Table 1 — Classification of pile joints

| Class | Capacity | Performance | Verification | Methods |
|----------|---------------------------------|-------------------------|---|--|
| A | Compression/tension and bending | Robustness and rigidity | Static calculations to be verified by impact testing and subsequent bending test. | Impact load test with 1 000 impact blows having stress level ^a 28 N/mm ² |
| B | Compression/tension and bending | Robustness and rigidity | Static calculations to be verified by impact testing and subsequent bending test. | Impact load test with 1 000 impact blows having stress level ^a 22 N/mm ² |
| C | Compression/tension and bending | Robustness and rigidity | Static calculations to be verified by impact testing and subsequent bending test. | Impact load test with 1 000 impact blows having stress level ^a 17 N/mm ² |
| D | Compression | Robustness and rigidity | Static calculations to be verified by impact testing. | Impact load test with 500 impact blows having stress level ^a 17 N/mm ² |

^a Stress level means compressive stresses around the pile joint caused by impact blows.

4.6 Drying shrinkage

For lightweight concrete, when assessed, the drying shrinkage shall be determined according to 5.4 and expressed in mm/m, rounded to 10 mm/m.

4.7 Density

For lightweight concrete, when assessed, the dry density shall be determined according to 5.5 and expressed in kg/m^3 , rounded to 10 kg/m^3 .

prEN 17808:2022 (E)**4.8 Loadbearing capacity****4.8.1 Blocks for beam-and-block floor systems**

When assessed, the loadbearing capacity of blocks for beam-and-block floor systems shall be determined and expressed according to one of the following classes:

Class A

The compliance criterion for class A shall be verified through the following characteristics:

- a) Punching-bending strength

The blocks shall be classified in type defined by the characteristic failure load obtained in the punching-bending test described in B.1. Table 2 gives the characteristic failure load (5 % fractile) for each type of block.

Table 2 — Concrete block types

| Type of block | Characteristic failure load by punching-bending (5 % fractile) in kN |
|----------------------|---|
| Non-resisting (NR) | 1,5 |
| Semi-resisting (SR) | 2,0 |
| Resisting (RR) | 2,5 |

For resisting blocks used in conjunction with self-bearing beams, without topping, the punching-bending test may be replaced by the transverse testing described in B.4.

- b) Longitudinal compressive strength of resisting and semi-resisting blocks

When the manufacturer declares a longitudinal compressive strength of at least 20 MPa with a view to take it into account in the design of the finished floor system, the longitudinal compressive strength of the resisting and semi-resisting blocks shall be tested according to B.3.

Class B

The compliance criterion for class B shall be verified through the following characteristics:

- a) Bending strength

When tested in accordance with B.2, concrete blocks of all types shall withstand a strip load of not less than $P = 12 L$ (kN) acting at the centre or at the least favourable point, with L given in m. The strip load shall be not less than 2,0 kN.

- b) Longitudinal compressive strength of resisting and semi-resisting blocks

When testing as specified in B.3 the characteristic value of the longitudinal compressive strength of the resisting blocks shall be not less than 16 MPa.

4.8.2 Masts and poles

When assessed, the loadbearing capacity of masts and poles shall be expressed as the ultimate force F_u in kN and the ultimate torsional moment in kNm and determined according to 5.8.2.

4.8.3 Boundary fences

When assessed, the loadbearing capacity of boundary fences shall be expressed as service load and failure load in N and determined according to 5.8.3.

4.9 Mechanical strength

4.9.1 Method 1

When assessed according to Method 1, the mechanical strength of the product is established through the following set of characteristics, as determined according to 5.9.1:

- compressive strength of concrete: see 4.1,
- ultimate tensile and tensile yield strength of steel: see 4.2,
- reference to the product documentation including geometrical data.

4.9.2 Method 2

When assessed according to Method 2, the relevant mechanical characteristics of the product are established by the manufacturer through the following, as determined according to 5.9.2:

- compressive strength of concrete: see 4.1,
- ultimate tensile and tensile yield strength of steel: see 4.2,
- reference to the design specification.

For reinforced garages, monolithic or consisting of single sections with room dimensions, the compliance criterion for the impact of vehicles with very low speed consists in showing 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.

For floor slats for livestock, the load class shall be assessed according to the minimum characteristic values in Table 3. For single beams these values shall be multiplied by 1,1.

Table 3 — Load classes and characteristic loading values for floor slats

| Load class | Linear load q_k (kN/m) | Vertical point load $F_{k,v}$ (kN) | Distance a (m) | Horizontal point load $F_{k,h}$ (kN) |
|------------|-----------------------------|---------------------------------------|---------------------|---|
| A1 | 2,5 | 1,2 | 0,5 | 0,5 |
| A2 | 5,0 | 4,2 | 0,8 | 2,5 |
| A3 | 5,0 | 4,2 | 0,8 | 2,5 |
| B1 | 0,8 | 0,8 | 0,3 | 0,1 |
| B2 | 1,5 | 1,0 | 0,5 | 0,5 |
| B3 | 2,5 | 1,3 | 0,5 | 1,0 |