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**Montažni betonski izdelki - Nosilci za stropne sisteme s polnili - 5. del: Lahki bloki za enostavne opaže**

Precast concrete products - Beam-and-block floor systems - Part 5: Lightweight blocks for simple formwork

Betonfertigteile - Balkendecken mit Zwischenbauteilen - Teil 5: Leichte Zwischenbauteile für einfache Schalungen

Produits préfabriqués en béton - Systèmes de planchers à poutrelles et entrevous - Partie 5: Entrevous légers de coffrage simple

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## Precast concrete products - Beam-and-block floor systems - Part 5: Lightweight blocks for simple formwork

Produits préfabriqués en béton - Systèmes de planchers à  
poutrelles et entrevous - Partie 5: Entrevous légers de  
coffrage simple

Betonfertigteile - Balkendecken mit Zwischenbauteilen -  
Teil 5: Leichte Zwischenbauteile für einfache Schalungen

This European Standard was approved by CEN on 21 January 2013.

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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Contents

Page

The numbering of clauses is strictly related to EN 13369, *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 standard, its number is omitted and this may result in a gap on numbering.

Foreword.....	4
Introduction .....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions .....	7
4 Requirements .....	8
4.1 Material requirements .....	8
4.2 Production requirements.....	9
4.3 Finished product requirements .....	9
5 Test methods.....	13
5.1 Measuring of dimensions .....	13
5.2 Determination of the weight.....	17
5.3 Mechanical strength.....	17
5.4 Reaction to fire test.....	27
5.5 Thermal conductivity .....	27
5.6 Thermal resistance of the floor system.....	27
6 Evaluation of conformity.....	28
6.1 General .....	28
6.2 Initial type tests.....	28
6.3 Factory production control.....	28
7 Marking.....	29
8 Technical documentation .....	29
Annex A (normative) Sampling for initial type testing and for independent testing of consignments.....	30
A.1 General .....	30
A.2 Sampling procedure.....	30
Annex B (normative) Factory production control.....	32
Annex C (normative) Gravity loading tests.....	34
C.1 Test rig.....	34
C.2 Procedure .....	37
C.3 Test report .....	38
Annex D (informative) Calibration of mechanical strength testing machine.....	39
D.1 Sample.....	39
D.2 Procedure .....	39
D.3 Validity.....	40
Annex E (normative) Compliance criteria for mechanical strength.....	41
Annex F (normative) Fire testing test for thin blocks.....	43
F.1 General .....	43
F.2 Terminology .....	43
F.3 Mounting and fixing .....	43
F.4 End Use Application Rules .....	45

<b>F.5</b>	<b>Additional conditions for polypropylene blocks.....</b>	<b>46</b>
<b>Annex ZA</b> (informative)	<b>Clauses of this European Standard addressing the provisions of the EU Construction Products Directive .....</b>	<b>48</b>
<b>ZA.1</b>	<b>Scope and relevant characteristics .....</b>	<b>48</b>
<b>ZA.2</b>	<b>Procedure for attestation of conformity of lightweight blocks for beam-and-block floor systems.....</b>	<b>49</b>
<b>ZA.3</b>	<b>CE marking and labelling.....</b>	<b>55</b>
	<b>Bibliography.....</b>	<b>58</b>

## **iTeh STANDARD PREVIEW** **(standards.iteh.ai)**

[SIST EN 15037-5:2013](https://standards.iteh.ai/catalog/standards/sist/d844791c-7ee1-47b6-843b-42866bb1feb2/sist-en-15037-5-2013)

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## EN 15037-5:2013 (E)

## Foreword

This document (EN 15037-5:2013) 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 November 2013, and conflicting national standards shall be withdrawn at the latest by November 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 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.

Eurocodes are taken as a common reference for design aspects. This document was examined and agreed upon by a liaison ad-hoc group with CEN/TC 250, particularly for its compatibility with structural Eurocodes. The installation of some structural precast concrete products is dealt with in EN 13670, *Execution of concrete structures*.

## iTeh STANDARD PREVIEW

EN 15037, *Precast concrete products — Beam and block floor systems* is composed of the following parts:

- *Part 1: Beams*
- *Part 2: Concrete blocks*
- *Part 3: Clay blocks*
- *Part 4: Expanded polystyrene blocks*
- *Part 5: Lightweight blocks for simple formwork* (the present document)

For common aspects of concrete products, reference is made to EN 13369, *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 by CEN/TC 229 product standards are intended to make them homogeneous and to avoid repetitions of similar requirements.

The program of standards for structural precast concrete products comprises the following standards, in some cases consisting of 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 13978-1, *Precast concrete products — Precast concrete garages — Part 1: Requirements for reinforced garages monolithic or consisting of single sections with room dimensions*
- 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 15050, *Precast concrete products — Bridge elements*
- EN 15258, *Precast concrete products — Retaining wall elements*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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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## Introduction

The evaluation of conformity refers to the completed precast elements which are supplied to the market and covers all the production operations carried out in the factory.

For design rules, reference is made to EN 1992-1-1. Additional complementary rules are provided where necessary.

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[SIST EN 15037-5:2013](https://standards.iteh.ai/catalog/standards/sist/d844791c-7ee1-47b6-843b-42866bb1feb2/sist-en-15037-5-2013)

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## 1 Scope

This European Standard deals with the requirements and the basic performance criteria for lightweight blocks used as formwork during the construction of the floor system. The blocks are used in conjunction with precast concrete beams in compliance with EN 15037-1, with or without cast-in-situ concrete for the construction of beam-and-block floor systems.

This European Standard does not deal with blocks made in polystyrene, with or without tong, or combined with different materials where polystyrene contributes to more than 50 % of the mechanical resistance of the block. These blocks are covered by EN 15037-4, *Precast concrete products — Beam-and-block floor systems — Part 4: Expanded polystyrene blocks*.

Examples of typology of floor systems are given in Annex B of EN 15037-1:2008.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 12667, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Products of high and medium thermal resistance*

EN 13369:2013, *Common rules for precast concrete products*

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

EN 13823:2010, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

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

EN ISO 10211, *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations (ISO 10211)*

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

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **lightweight block for simple formwork**

block with no mechanical function in the final floor system

Note 1 to entry: Its only mechanical function is that of formwork during the construction of the floor system.

Note 2 to entry: This block is mentioned in the present standard as lightweight block. See Figure 1.

## EN 15037-5:2013 (E)

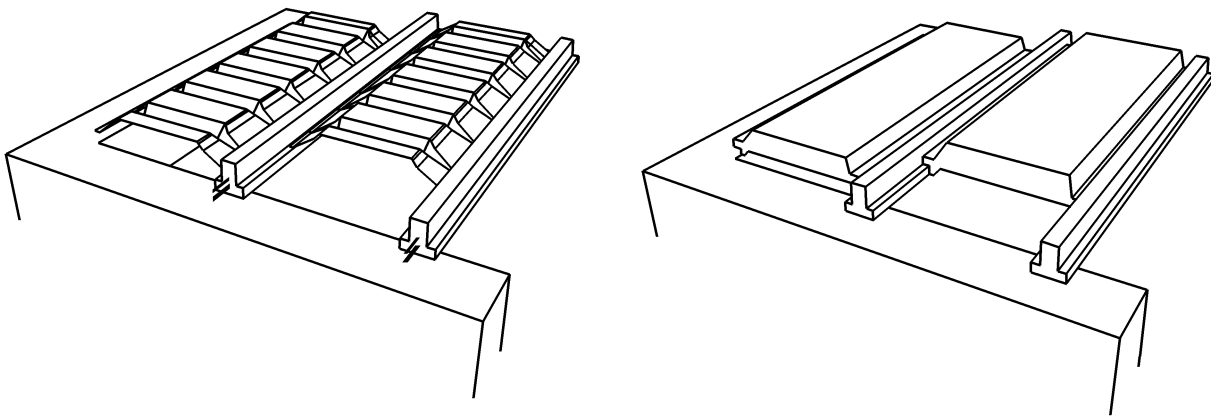


Figure 1 — Examples of lightweight blocks

- 3.2 cut block**  
lightweight block, the form of which is obtained by cutting
- 3.3 moulded block**  
lightweight block formed by moulding, either by injection of the material in a mould (injected blocks), or by pressing of the material in a mould (pressed block)
- 3.4 thin block**  
lightweight block formed as a vault made of one or several layers of material
- 3.5 thick block**  
lightweight block constituted by one or several materials, which forms a filled product
- 3.6 family**  
group of products for which the test results for one or more characteristics from any one product within the family are valid for all other products within the family
- Note 1 to entry: The definition of the family takes into account at least a same material and a similar shape and geometry.
- 3.7 batch**  
quantity of lightweight blocks defined by either a same reference of raw material, or similar parameters and conditions of manufacturing, or manufactured during the same day of production (or 24 h in case of continuous production), without exceeding a length of 10 000 m

## 4 Requirements

### 4.1 Material requirements

Only materials with established suitability shall be used.

Lightweight block may be manufactured from:

- a) wood material (plywood, fibreboards, Oriented Strand Board OSB);
- b) plastic material (polyethylene PE, polypropylene PP);
- c) cardboard, cellulose;
- d) composite material (Glass Reinforced Plastic GRP);
- e) polymer concrete;
- f) metallic material;
- g) combination of the materials a) to f);
- h) one of the materials a) to f) combined with polystyrene, if this one contributes to not more than 50 % of the mechanical resistance of the block.

For a particular material, other than the ones mentioned above, the establishment of suitability may result from a European Standard which refers specifically to the use of this material for a similar use; in absence of a European Standard it may also result, under the same conditions, from an ISO standard.

Where this material is not covered by a European or an International 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 refer specifically to the use of this material for a similar use;

or

- a European Technical Approval specifically for the use of this material for a similar use.

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## 4.2 Production requirements

Only the materials described in 4.1 shall be used in the production of lightweight blocks.

## 4.3 Finished product requirements

### 4.3.1 Geometrical properties

The dimensions shall be verified according to 5.1.1.

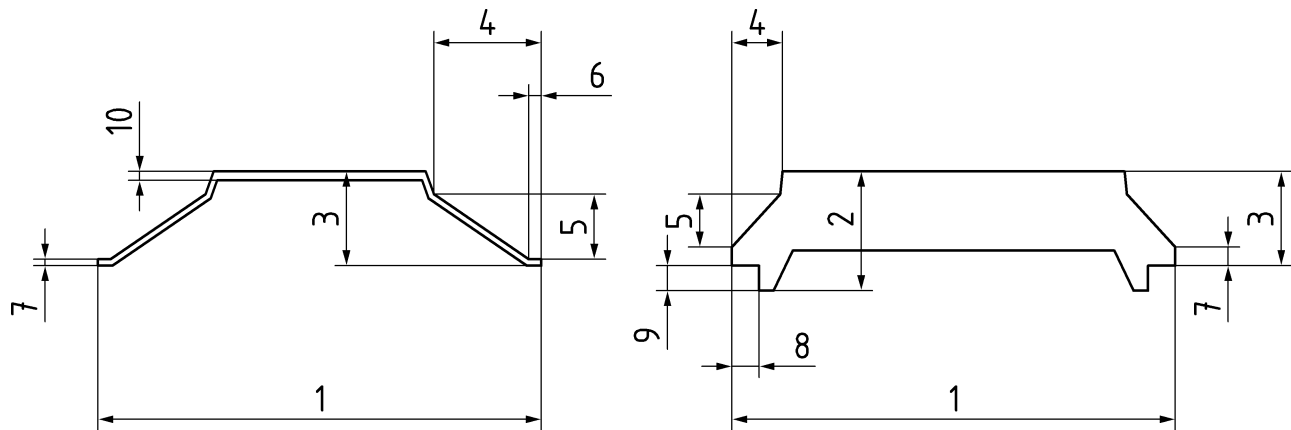
For technical documentation, see Clause 8.

#### 4.3.1.1 Production tolerances

##### 4.3.1.1.1 Dimensional tolerances

The tolerances on the dimensions are given in Table 1. An example of the dimensions is given in Figure 2.

## EN 15037-5:2013 (E)



## Key

- |   |   |    |  |
|---|---|----|--|
| 1 | block width $l$   | 6  | width of the support nib $l_n$ (when relevant) |
| 2 | block height $h$ for blocks with a rebate or end plates for beams | 7  | height of the support nib $h_n$                |
| 3 | height above beam support $h_1$                                   | 8  | rebate width $l_r$ (when relevant)             |
| 4 | chamfer width $l_c$   | 9  | rebate height $h_r$ (when relevant)            |
| 5 | chamfer height $h_c$  | 10 | minimal thickness $e_m$ for thin blocks        |

Figure 2 — Dimensions of the lightweight block

Table 1 — Dimensional tolerances

Dimensions	Tolerance
1 — width of the block $l$	$\pm 5$ mm
2 — height of the block $h$ for blocks with rebate or end plates	$[- 3$ mm ; $+ 7$ mm]
3 — height above beam support $h_1$	$\pm 5$ mm
length of the block $L$ (see Figure 6)	$\pm \text{Max} [0,6 \% ; 5 \text{ mm}] \leq 12$ mm
4 — width of the chamfer $l_c$	$\pm 10$ mm
5 — height of the chamfer $h_c$	$\pm 5$ mm
6 — width of the support nib in upper part $l_n$ (when relevant)	$\pm 3$ mm
7 — height of the support nib $h_n$	$[- 2$ mm ; $+ 4$ mm]
8 — width of the rebate $l_r$ (when relevant)	$\pm 3$ mm
9 — height of the rebate $h_r$ (when relevant)	$\pm 3$ mm
10 — minimal thickness $e_m$ <sup>a</sup> for thin blocks	$[- e_m/10 ; + 2$ mm]
<sup>a</sup> Applicable on the vault and the wall(s) of the block, outside the zones where the mechanical contribution is negligible.	
Lower tolerances may be declared by the manufacturer.	

## 4.3.1.1.2 Straightness

Straightness shall be verified according to 5.1.2.

The tolerances are:

- $\pm 1/250^{\text{th}}$  of the block length in the vertical plane;

—  $\pm$  Min [ $1/250^{\text{th}}$  of the block length; 5 mm] in the horizontal plane.

#### 4.3.1.1.3 Warping

Warping shall be verified according to 5.1.3.

The tolerance is  $\pm 1/250^{\text{th}}$  of the block length.

#### 4.3.1.1.4 Weight

The manufacturer shall declare the weight of the blocks in kilograms.

The tests shall be carried out according to 5.2. The results should not deviate from the manufacturer's declared values by more than  $\pm 10\%$ .

#### 4.3.1.2 Shape of blocks

The following nominal dimensions (see Figures 3, 5 and 6) shall be declared:

- block width  $l$ ;
- block height above beam support  $h_1$ ;
- block length  $L$ .

The characteristic width of lightweight block's rebate shall not be less than 20 mm.

#### 4.3.2 Surface characteristics

Blocks shall not have defects which may be detrimental to their mechanical and thermal performances.

For test method, see 5.1.4.

#### 4.3.3 Mechanical resistance

##### 4.3.3.7 Resistance to concentrated load

The manufacturer shall declare the class and the conditions of installation of the blocks such as the set of fitting or tightening.

The guaranteed value by the manufacturer shall be the characteristic resistance to concentrated load for 5 % fractile  $P_{Rk}$ , and shall be recorded in the documentation of the manufacturer for its factory production control (see 6.3).

For each class, the characteristic resistance to concentrated load  $P_{Rk}$  shall not be less than the value given in Table 2.

The test shall be carried out according to 5.3.4 and 5.3.5. The results shall be evaluated in accordance with the statistical procedure described in Table 3. Annex E shall be used for the assessment of conformity.

Table 2 — Lightweight block classes

Class	Concentrated load	Minimum characteristic resistance to concentrated load $P_{Rk}$ (5 % fractile) in kN
R1	Test on individual blocks according to 5.3.5	1,5
R2	Test on restrained blocks according to 5.3.4	1,5
	And test on individual blocks according to 5.3.5	1,3

#### 4.3.4 Resistance and reaction to fire

##### 4.3.4.1 Resistance to fire

Where applicable, subclauses 4.3.4.1 to 4.3.4.3 of EN 13369:2013 shall apply.

For the verification of fire resistance of the floor system by testing, EN 1365-2 may apply. A method of calculation is given in Annex K of EN 15037-1:2008 to determine the fire resistance of the floor system.

##### 4.3.4.4 Reaction to fire

The manufacturer shall declare a Euroclass reaction to fire in accordance with EN 13501-1.

NOTE The experience shows that lightweight blocks on the market might be classified E or F.

##### 4.3.5 Acoustic properties

Acoustic properties depend on the finished floor system (type of blocks, applied elements in upper and/or lower face of the floor, etc.).

When required for the product, subclause 4.3.5 of EN 13369:2013 shall apply.

For design purposes, and in the absence of measurement results, the method given in Annex L of EN 15037-1:2008 may be used (airborne and impact sound insulation).

##### 4.3.6 Thermal properties

When relevant, the  $\lambda_{90,90}$  value (thermal conductivity) and the  $R$  value (thermal resistance) and the  $U$  value (thermal transmittance) of the specified floor shall be declared.

The thermal conductivity ( $\lambda_{90,90}$ ) shall be measured in accordance with 5.5.

For the calculation of the thermal resistance of the floor ( $R$  value /  $U$  value), the non-rounded  $\lambda$  value may be used. A method is given in 5.6. Another method may be used, provided that the results are equivalent.

If the thermal properties are calculated, the calculation assumptions for thermal resistance of floor which are given in Annex F of EN 15037-4:2010 should be used.

### 4.3.7 Durability

The durability of blocks shall be consistent with the building methods used for the construction of the floor system.

NOTE For example, EN 335-1 defines classes for wood and wood based materials.

### 4.3.9 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonised test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through: <http://ec.europa.eu/enterprise/construction/cpd-ds/>

## 5 Test methods

### 5.1 Measuring of dimensions

#### 5.1.1 Block dimensions

##### 5.1.1.1 General

The following dimensions shall be checked with a measurement device having an accuracy of 1/5 or better of the tolerance to be checked. For irregular or ribbed surfaces, the measurement points shall be consistent with the definition of the relevant dimensions in the manufacturer documentation, except the thickness of the vault " $e_m$ " to the nearest 0,1 mm.

##### 5.1.1.2 Procedure

###### a) Block width $l$

Measure the width of each end section as shown in Figure 3 (the larger width).

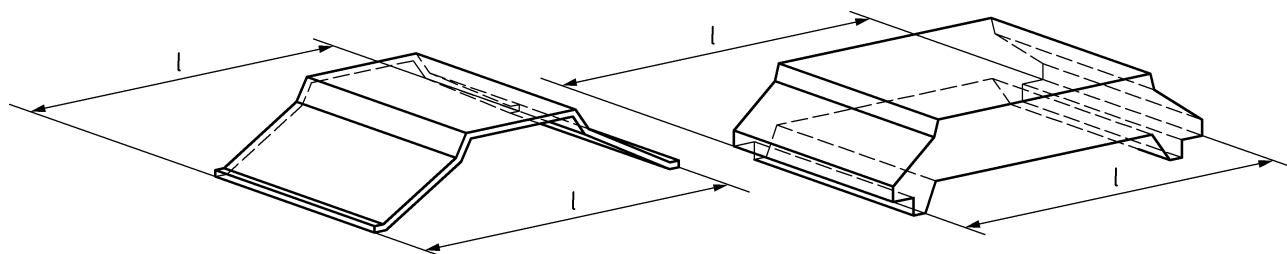


Figure 3 — Measurement of the width of the block

Calculate the width for the block as the mean of the two measurements values.

The dimensions shall comply with the requirements of 4.3.1, and the values declared by the manufacturer, within the tolerances given in 4.3.1.1.1.

###### b) Block height $h$ (for blocks with a rebate or end plates for beams)

Measure the height  $h$  of each end section as shown in Figure 4 approximately at its mid-width.