



# SLOVENSKI STANDARD

## SIST EN 15037-4:2010

01-junij-2010

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### Montažni betonski izdelki - Stropni sistemi iz nosilcev in polnil - 4. del: Polnila iz ekspandiranega polistirena

Precast concrete products - Beam-and-block floor systems - Part 4: Expanded polystyrene blocks

Betonfertigteile - Balkendecken mit Zwischenbauteilen - Teil 4: Zwischenbauteile aus gedehntem Polystyrol

Produits préfabriqués en béton - Systèmes de planchers à poutrelles et entrevous - Partie 4: Entrevous en polystyrène expansé

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Ta slovenski standard je istoveten z: EN 15037-4:2010

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91.060.30	Stropi. Tla. Stopnice	Ceilings. Floors. Stairs
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EUROPEAN STANDARD

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NORME EUROPÉENNE

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January 2010

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## Precast concrete products - Beam-and-block floor systems - Part 4: Expanded polystyrene blocks

Produits préfabriqués en béton - Systèmes de planchers à poutrelles et entrevous - Partie 4: Entrevous en polystyrène expansé

Betonfertigteile - Balkendecken mit Zwischenbauteilen - Teil 4: Zwischenbauteile aus gedehntem Polystyrol

This European Standard was approved by CEN on 1 November 2009.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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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 13369:2004 is not relevant or included in a more general reference of this standard, its number is omitted and this can result in a gap on numbering.

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## Foreword

This document (EN 15037-4:2009) 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 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 2010, and conflicting national standards shall be withdrawn at the latest by October 2011.

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.

EN 15037, *Precast concrete products — Beam-and-block floor systems*, consists of five parts:

— *Part 1: Beams*

— *Part 2: Concrete blocks*

— *Part 3: Clay blocks*

— *Part 4: Expanded polystyrene blocks*

— *Part 5: Lightweight blocks for simple formwork* <sup>1)</sup>

For common aspects of concrete products, reference is made to EN 13369, from which also the relevant requirements of the EN 206-1 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.

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. In all countries it may be accompanied by alternatives for national application and it should not be treated as a European Standard.

The program of standards for structural precast concrete products comprises the following European 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*

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1) To be developed.

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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, *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, *Precast concrete products — Beam-and-block floor systems*

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 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 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.

**NOTE** This European Standard is applied in Europe under different climatic and geographical conditions, different levels of protection and under different, well-established, regional traditions and experience. Classes for EPS blocks have been introduced to cover these situations. Where such general solutions were not possible, the relevant clauses contain permission for the application of national standards or provisions valid in the place of use of the EPS Blocks (see 4.3.3).

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**EN 15037-4:2010 (E)****1 Scope**

This European Standard deals with the requirements and the basic performance criteria for blocks made in expanded polystyrene (EPS), 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.

EPS block may be totally made in EPS or combined with different materials such as plaster or wood wool.

If EPS is combined with other materials, these materials should not contribute to more than 50 % of the mechanical resistance of the block. If not, the block is covered by EN 15037-5, *Precast concrete products — Beam-and-block floor systems — Part 5: Lightweight blocks for simple formwork*.

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

**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 826, *Thermal insulating products for building applications — Determination of compression behaviour*

EN 1365-2, *Fire resistance tests for loadbearing elements — Part 2: Floors and roofs*

EN 12390-4:2000, *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 13163:2008, *Thermal insulation products for buildings — Factory made products of expanded polystyrene (EPS) — Specification*

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

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

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

EN ISO 10211, *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations (ISO 10211:2007)*

**3 Terms and definitions**

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

**3.1****EPS block type R1**

block with no mechanical function in the final floor system

NOTE Its only mechanical function is that of formwork during the construction of the floor system.



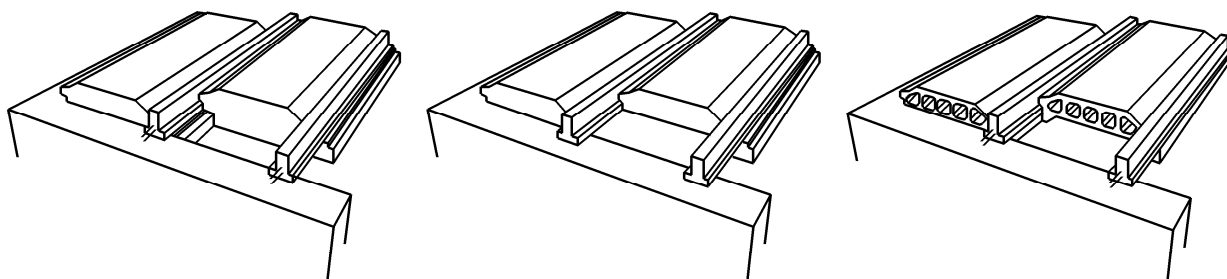


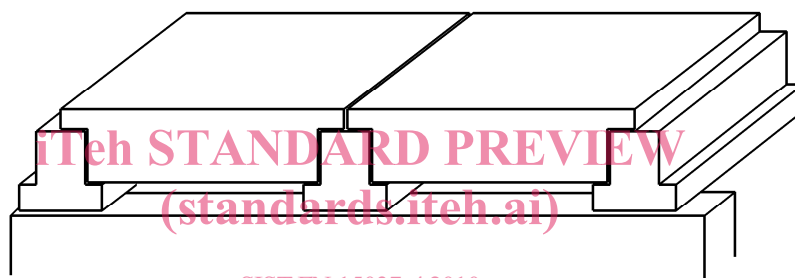
Figure 1 — Examples of EPS blocks type R1

### 3.2

#### EPS block type R2

block that contributes to the mechanical function of the final floor in conjunction with a timber deck or screed

NOTE EPS blocks type R2 are generally used with self-bearing beams.



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Figure 2 — Examples of EPS blocks type R2

### 3.3

#### cut block

EPS block formed by cutting from EPS block

### 3.4

#### moulded block

EPS block formed by moulding

### 3.5

#### 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

### 3.6

#### batch

quantity of EPS blocks defined by:

- a same reference of raw material;
- similar parameters and conditions of expansion;
- similar parameters and conditions of moulding;
- an expanded volume which does not exceed 1 000 m<sup>3</sup>

**EN 15037-4:2010 (E)****4 Requirements****4.1 Material requirements**

The material EPS used shall comply the relevant requirements defined in EN 13163.

If other materials are used in combination with EPS, there suitability shall be established.

The establishment of suitability may result from a European Standard which refers specifically to the use of this material in building products; 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 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 in building products; or
- a European Technical Approval specifically for the use of this material in building products.

**4.2 Production requirements**

Only the materials in accordance with 4.1 shall be used in the production of EPS blocks.

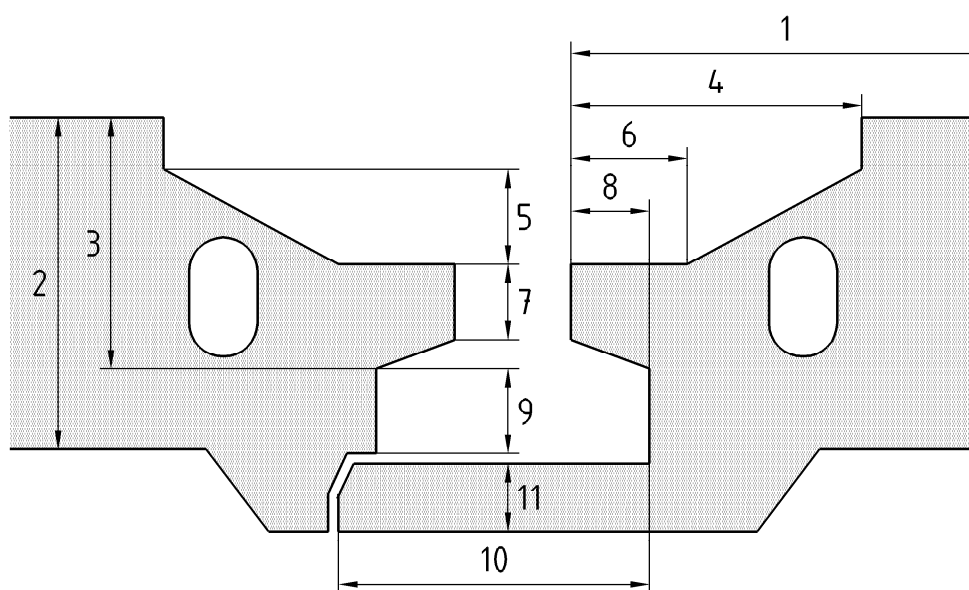
**4.3 Finished product requirements****4.3.1 Geometrical properties**

NOTE For technical documentation, see Clause 8. [SIST EN 15037-4:2010  
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**4.3.1.1 Production tolerances****4.3.1.1.1 Dimensional tolerances**

The dimensions shall be verified according to 5.1.1.

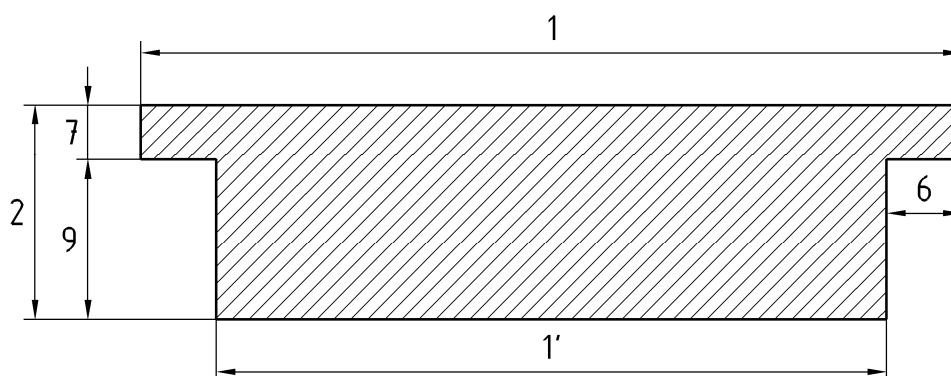
The tolerances on the dimensions are given in Table 1.

**Key**

- |   |                                 |    |                                 |
|---|---------------------------------|----|---------------------------------|
| 1 | block width $l$                 | 7  | height of the support nib $h_n$ |
| 2 | block height $h$                | 8  | rebate width $l_r$              |
| 3 | height above beam support $h_1$ | 9  | rebate height $h_r$             |
| 4 | chamfer width $l_c$             | 10 | tongue width $l_t$              |
| 5 | chamfer height $h_c$            | 11 | tongue thickness $h_t$          |
| 6 | width of the support nib $l_n$  |    |                                 |

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**Figure 3 — Dimensions of the EPS block type R1**

**Key**

- |    |                          |   |                                 |
|----|--------------------------|---|---------------------------------|
| 1  | block top width $l$      | 6 | width of the support nib $l_n$  |
| 1' | block bottom width $l_b$ | 7 | height of the support nib $h_n$ |
| 2  | block height $h$         | 9 | rebate height $h_r$             |

**Figure 4 — Dimensions of the EPS block type R2**

Table 1 — Dimensional tolerances

Dimensions	Tolerance
1 and 1' - width of the block $l$ and $l_b$	$\pm 5$ mm
2 - height of the block $h$	$[- 3$ mm ; $+ 7$ mm]
3 - height above beam support $h_1$	$\pm 5$ mm
length of the block $L$	$\pm$ max. $[0,6 \% ; 5$ 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 $l_n$	$\pm 3$ mm
7 - height of the support nib $h_n$	$[- 2$ mm ; $+ 4$ mm]
8 - width of the rebate $l_r$	$\pm 3$ mm
9 - height of the rebate $h_r$	$\pm 3$ mm
10 - width of the tongue $l_t$	$\pm 5$ mm
11 - thickness of the tongue $h_t$	$[- 3$ mm ; $+ 7$ mm]
NOTE 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:

- $\pm 1/250$  of the block length in the vertical plane,
- $\pm$  min.  $[1/250$  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  $\pm 1/250$  of the block length.

#### 4.3.1.2 Minimum dimensions

The actual width of EPS block rebate shall not be less than 20 mm.

#### 4.3.1.3 Shape of blocks

The following nominal dimensions (see Figures 5, 6 and 8) shall be declared:

- block width  $l$ ;
- block height  $h$ ;
- block length  $L$ ;
- tongue thickness  $h_t$ .

### 4.3.2 Surface characteristics

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

For test method see 5.1.4.

### 4.3.3 Resistance to concentrated loads

The manufacturer shall declare the class and the conditions of installation of the blocks, in accordance with the tests carried out.

NOTE However, it is permitted to prescribe in national standards or provisions requirements for the application of the blocks with specific declared classes among those defined in Table 2 and conditions of installation.

The guaranteed value by the manufacturer shall be characteristic resistance to concentrated loads 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 loads  $P_{Rk}$  shall not be less than the value given in Table 2.

When tested in accordance with 5.2.3 and 5.2.4, 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 — EPS block classes**

Type	Class	(standards.iteh.ai) Concentrated loads test SIST EN 15037-4:2010	Minimum characteristic resistance to concentrated loads $P_{Rk}$ (5 % fractile) in kN
Type R1	R1 a	Test on individual blocks according to 5.2.4	1,5
	R1 b	Test on restrained blocks according to 5.2.3	1,5
		And test on individual blocks according to 5.2.4	1,3
Type R2	R2	Test on individual blocks according to 5.2.4	2,0

NOTE EPS blocks meeting the requirements of class I a meet in fact the requirements of class R1 b.

### 4.3.4 Compressive resistance

EPS blocks class R2 shall meet the following requirements:

The minimum class shall be CS(10)200 (compressive strength  $\geq 200$  kPa for 10 % of deformation) in accordance with EN 13163:2008. Compressive resistance shall be measured in accordance with 5.3.

### 4.3.5 Resistance and reaction to fire

#### 4.3.5.1 Resistance to fire

Where applicable, 4.3.4.1 to 4.3.4.3 of EN 13369:2004 shall apply.

For the verification of fire resistance of the floor system by testing, EN 1365-2 may apply.

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NOTE A calculation method is given in Annex K of EN 15037-1:2008 to determine the fire resistance of the floor system.

**4.3.5.2 Reaction to fire**

The manufacturer shall declare reaction to fire. Reaction to fire classification (Euroclasses) shall be determined in accordance with EN 13501-1.

In absence of appropriate European requirements for testing, the reaction to fire shall be assessed according to a test method valid in the place where the product is used.

**4.3.6 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.).

Where relevant, 4.3.5 of EN 13369:2004 should be applied.

NOTE 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).

**4.3.7 Thermal properties**

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 5.4.

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 5.5. Another method may be used, provided that the results are equivalent.

NOTE The calculation assumptions for thermal resistance of floor which are given in Annex F should be used.

**4.3.8 Durability**

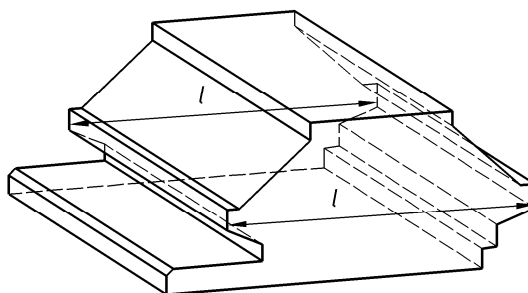
The durability of blocks shall be consistent with the durability of beams used for the construction of the floor system.

**5 Test methods****5.1 Measuring of dimensions****5.1.1 Block dimensions****5.1.1.1 General**

Check the following dimensions to the nearest 1,0 mm.

**5.1.1.2 Procedure**a) Block width  $l$ 

Measure the width of each end section as shown in Figure 5 (the larger width).



**Figure 5 — Measurement of the width of the block**

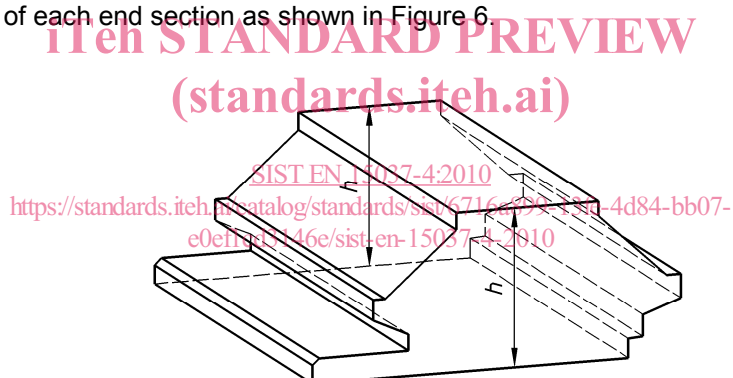
Calculate the width for the block as the mean of the two measurement values.

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.

NOTE For the blocks type R2, it is necessary to measure the two widths  $l$  and  $l_b$ .

b) Block height  $h$

Measure the height of each end section as shown in Figure 6.



**Figure 6 — Measurement of the height of the block**

Calculate the height for the block as the mean of the two measurement 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.

c) Height above beam support  $h_1$

Measure the height above beam support of each end section as shown in Figure 7.