



**SLOVENSKI STANDARD**  
**SIST EN 15732:2013**

**01-februar-2013**

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**Toplotnoizolacijski in lahki polnilni proizvodi za inženirske objekte (CEA) -  
Proizvodi iz ekspandiranega glinenega agregatnega proizvoda (LWA)**

Light weight fill and thermal insulation products for civil engineering applications (CEA) -  
Expanded clay lightweight aggregate products (LWA)

Leichte Schütt- und Wärmedämmstoffe für bautechnische Anwendungen (CEA) -  
Produkte aus Blähton-Leichtzuschlagstoffen (LWA)

Matériaux de remplissage légers et produits isolants thermiques pour les applications du  
génie civil - Produits à base de granulats légers d'argile expansée

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**Ta slovenski standard je istoveten z: EN 15732:2012**

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**ICS:**

91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials
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EUROPEAN STANDARD

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## Light weight fill and thermal insulation products for civil engineering applications (CEA) - Expanded clay lightweight aggregate products (LWA)

Matériaux de remplissage légers et produits isolants thermiques pour les applications du génie civil - Produits à base de granulats légers d'argile expansée

Leichte Schütt- und Wärmedämmstoffe für bautechnische Anwendungen (CEA) - Produkte aus Blähton-Leichtzuschlagstoffen (LWA)

This European Standard was approved by CEN on 9 September 2012.

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**EN 15732:2012 (E)****Foreword**

This document (EN 15732:2012) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.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.

This standard is the harmonised part satisfying the mandate, the CPD and is the basis for the CE marking, covers the products which are placed on the market.

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, 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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## 1 Scope

This European Standard describes the product characteristics and includes procedures for testing, marking and labelling.

This standard specifies the requirements for loose-fill expanded clay lightweight aggregate (expanded clay LWA) products for Civil Engineering Applications excluding the use as thermal insulation in and under buildings which are covered by EN 14063-1. The standard covers the use of expanded clay LWA as lightweight fill and insulation materials in embankments for roads, railways and other trafficked areas and as lightweight backfill for structures.

This standard does not specify the required level of a given property to be achieved by a product to demonstrate fitness for purpose in a particular application. The levels required for a given application are to be found in regulations or non-conflicting standards.

## 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 932-1, *Tests for general properties of aggregates — Part 1: Methods for sampling*

EN 932-2, *Tests for general properties of aggregates — Part 2: Method for reducing laboratory samples*

EN 933-1, *Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method*

EN 1097-3, *Tests for mechanical and physical properties of aggregates — Part 3: Determination of loose bulk density and voids*

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EN 1097-5, *Tests for mechanical and physical properties of aggregates — Part 5: Determination of the water content by drying in a ventilated oven*

EN 1097-6:2000, *Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption*

EN 13055-1:2002, *Lightweight aggregates — Part 1: Lightweight aggregates for concrete, mortar and grout*

EN 13055-2:2004, *Lightweight aggregates — Part 2: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications*

EN 13172:2012, *Thermal Insulation products — Evaluation of conformity*

EN 13286-4, *Unbound and hydraulically bound mixtures — Part 4: Test methods for laboratory reference density and water content — Vibrating hammer*

EN 13286-5, *Unbound and hydraulically bound mixtures — Part 5: Test methods for laboratory reference density and water content — Vibrating table*

EN 13286-7, *Unbound and hydraulically bound mixtures — Part 7: Cyclic load triaxial test for unbound mixtures*

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

EN 13820, *Thermal insulating materials for building applications — Determination of organic content*

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EN 14063-1, *Thermal insulation products for buildings — In-situ formed expanded clay lightweight aggregate products — Part 1: Specification for the loose-fill products before installation*

EN ISO 9229:2007, *Thermal insulation — Vocabulary (ISO 9229:2007)*

EN ISO 10456:2007, *Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)*

**3 Terms definitions, symbols, units and abbreviated terms****3.1 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 9229:2007, and the following apply.

**3.1.1****expanded clay lightweight aggregate**

insulation material or product composed of lightweight granular material having a cellular structure formed by expanding clay minerals by heat

**3.1.2****compressibility**

deformation at a certain load of a vibrated specimen, given as a load-deformation curve

**3.1.3****compressive strength, CS(10)**

the load where the deformation of a vibrated specimen is 10 %

**3.1.4****stiffness modulus**

is given as the tangent to the load-deformation curve and is related to the level of deformation

**3.1.5****compressive creep (CC)**

the deformation at a constant load in a specified time

**3.1.6****compaction**

mechanical compression (e.g. by vibrator) of the installed insulation layer, expressed as a percentage of the initial untreated layer thickness

**3.1.7****level**

given value, which is the upper or lower limit of a requirement. The level is given by the declared value of the characteristic concerned

**3.1.8****class**

combination of two levels of the same property, between which the performance falls, where the levels are given by the declared value of the characteristic concerned

**3.2 Symbols, units and abbreviated terms**

Symbols and units used in this standard:

LD is the symbol of the declared level for loose bulk density

PS is the symbol of the declared level for aggregate size (mm)



CS(10) is the symbol of the declared level for compressive strength at 10 % deformation

CC is the symbol of the declared level for compressive creep

Abbreviated terms used in this standard:

LWA is **L**ightweight **A**ggregate

ITT is **I**nitial **T**ype **T**est

CEA is **C**ivil **E**ngineering **A**pplications

## 4 Requirements

### 4.1 General

Product properties shall be assessed in accordance with Clause 5. To conform with this standard, products shall meet the requirements of 4.2 and the requirements of 4.3 as appropriate.

Sampling of expanded clay LWA shall be performed according to EN 932-1 and splitting of samples according to EN 932-2.

One test result on a product property is the average of the measured values on the number of test specimens given in Table 1.

### 4.2 For all applications

#### 4.2.1 Loose bulk density

Loose bulk density shall be declared and determined in accordance with EN 1097-3. The dry loose bulk density shall be declared by the manufacturer in steps of  $5 \text{ kg/m}^3$  up to a density of  $400 \text{ kg/m}^3$  and thereafter in steps of  $10 \text{ kg/m}^3$ . It shall be in the range of  $\pm 15\%$  of the manufacturers declared value with a maximum of  $\pm 100 \text{ kg/m}^3$ . The value shall be expressed in  $\text{kg/m}^3$ .

NOTE The value of the density used for design purposes will be influenced by compaction and water content.

#### 4.2.2 Particle size distribution

##### 4.2.2.1 General

Particle size distribution shall be measured in accordance with EN 933-1, without washing, and shall be declared in % by mass.

##### 4.2.2.2 Aggregate size

The pair of sieve sizes between which the main proportion of the particles lies shall designate the size and any undersize or oversize shall comply with 4.2.2.3 and 4.2.2.4.

The sieve sizes in mm shall be selected from the specifications in EN 13055-2.

NOTE Normally the aggregate size for expanded clay LWA products will be in the range 0 mm - 32 mm.

##### 4.2.2.3 Undersize

The content of undersize material shall not exceed 15 % by mass.

**EN 15732:2012 (E)****4.2.2.4 Oversize**

The content of oversize material shall not exceed 10 % by mass.

**4.2.3 Reaction to fire**

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

NOTE Expanded clay LWA described in 3.1.1 of the standard is classified, without testing, as a class A1 product in accordance with Commission Decision 96/603/EC as amended by decision 2000/605/EC.

**4.2.4 Durability characteristics****4.2.4.1 General**

The appropriate durability characteristics have been considered and are covered in 4.2.4.2 to 4.2.4.6.

NOTE The product is a clay mineral product thermo-processed to form a stable structure.

**4.2.4.2 Durability of reaction to fire against ageing/degradation**

The reaction to fire performance of expanded clay LWA does not change with time.

**4.2.4.3 Durability of thermal resistance against ageing/degradation**

The thermal conductivity (4.3.2) of the product does not change with time.

**4.2.4.4 Durability of compressive strength against ageing/degradation**

The compressive strength of expanded clay does not change with time.

**4.2.4.5 Durability of resistance to dynamic loads against ageing/degradation**

The resistance to dynamic loads does not change with time.

**4.2.4.6 Durability against chemicals and biological attack**

The expanded clay LWA is a ceramic material and is durable against chemicals and biological attack.

**4.3 For specific applications****4.3.1 General**

If there is no requirement for a property, described in 4.3.2 – 4.3.16, for a product in use, then the property need not to be determined and declared by the manufacturer.

**4.3.2 Thermal resistance and thermal conductivity**

The thermal conductivity and thermal resistance shall be determined in accordance with EN 14063-1.

NOTE For light weight fill applications without specific thermal insulation requirements tabulated thermal values in accordance with Annex E may be used.

**4.3.3 Specific heat capacity**

Specific heat capacity shall be determined in accordance with EN ISO 10456.

NOTE In accordance with EN ISO 10456:2007, Table 4, a typical value for specific heat capacity of 1000J/(kg K) can be used.

#### 4.3.4 Particle density

The particle density of the grains shall be determined in accordance with EN 1097-6:2000, Annex C. It shall be in the range of  $\pm 15\%$  with a maximum of  $\pm 150 \text{ kg/m}^3$  of the declared value.

NOTE EN 1097-6:2000, Annex C is only applicable to aggregate particles larger than 4 mm.

#### 4.3.5 Water content

The water content shall be determined in accordance with EN 1097-5.

#### 4.3.6 Water absorption

The water absorption after an immersion time of 28 days shall be determined in accordance with EN 1097-6:2000, Annex C.

NOTE EN 1097-6:2000, Annex C is only applicable to aggregate particles larger than 4 mm.

#### 4.3.7 Compressibility and confined compressive strength

The compressibility, in terms of load-deformation curve, stiffness modulus, and the compressive strength  $CS(10)$  shall be determined in accordance with EN 13055-2:2004, Annex A. The stiffness modulus shall be given as the tangent to the stress-strain relationship curve and related to the level of deformation.

NOTE The compressive strength at 10 % strain is not a design value, it is used as a reference value for material characterisation only. For characterisation of material properties the stiffness modulus and the load at a strain level at maximum 2 % is more relevant.

#### 4.3.8 Compressive creep

The compressive creep, in terms of deformation in % of the height of a vibrated sample, shall be determined in accordance with Annex C. The load shall be applied in load steps corresponding to stress levels of  $50 \text{ N/mm}^2$  from  $50 \text{ N/mm}^2$  and upwards.

#### 4.3.9 Shear strength – static loading

The shear strength properties shall be determined in accordance with Annex A.

#### 4.3.10 Cyclic compression

The cyclic compression shall be determined in accordance with Annex B. The cyclic load shall be applied in load steps corresponding to stress levels of  $50 \text{ N/mm}^2$  from  $50 \text{ N/mm}^2$  and upwards. The results shall be given as deformation in % related to the stress level.

#### 4.3.11 Shear strength – cyclic loading

The resilient modulus (elastic stiffness) and resistance to permanent deformations shall be determined by cyclic triaxial tests. Cyclic triaxial testing shall be performed in accordance with EN 13286-7. The multistage loading procedure (low stress level) shall be followed.

NOTE The development of permanent deformations is highly dependent on the stress history. This should be taken into consideration when the results from the test are used.

#### 4.3.12 Water permeability

The property is not measured because the open structure of the final product itself offers no substantial resistance to the free movement of water.

NOTE Based on experience; the typical graded expanded clay LWA has a permeability greater than  $10^{-3} \text{ m/s}$ .

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### 4.3.13 Water vapour transmission

The property is not measured because the open structure of the final product itself offers no substantial resistance to the free movement of water vapour.

NOTE According to EN ISO 10456, a typical water vapour resistance factor is 2.

### 4.3.14 Chemical content

The chemical content of the expanded clay LWA shall be determined in accordance with EN 13055-2.

### 4.3.15 Freezing and thawing resistance

The freezing and thawing resistance of expanded clay LWA shall be determined in accordance with EN 13055-2:2004, Annex B.

### 4.3.16 Release of dangerous substances

Expanded Clay LWA shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination.

## 4.4 Other requirements

### 4.4.1 Crushing resistance

The crushing resistance shall be measured in accordance with EN 13055-1:2002, Annex A.

NOTE The crushing resistance is entirely to be used for quality documentation and factory production control. There is no correlation between the crushing resistance and relevant properties for the end use conditions.

## 5 Test methods

### 5.1 Sampling

Sampling shall be carried out according to the procedures given in EN 932-1.

### 5.2 Conditioning

If not otherwise prescribed in the test method, the test specimens shall be dried to constant mass according to EN 1097-5 (at  $110 \pm 5$  °C).

### 5.3 Testing

#### 5.3.1 General

Table 1 gives the minimum number of measurements required to get one test result and any specific conditions, which are necessary.

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Table 1 — Test methods, test specimens and specific conditions

Clause				
No.	Title	Test method	Minimum number of test specimens to get one test result	Specific conditions
4.2.1	Loose bulk density	EN 1097-3	3	
4.2.2	Particle size distribution	EN 933-1	1	
4.2.3	Reaction to fire (organic content)	EN 13820	See Annex ZA, reaction to fire class A1 without testing	
4.3.2	Thermal conductivity	In accordance with EN 14063-1		
4.3.4	Particle density	EN 1097-6:2000, Annex C	2	
4.3.5	Water content	EN 1097-5	3	Not applicable for ITT
4.3.6	Water absorption	EN 1097-6:2000, Annex C	2	
4.3.7	Compressibility and confined compressive strength	Compressibility and confined compressive strength (EN13055-2:2004, Annex A)	3	
4.3.8	Compressive creep	Annex C	3	
0	Shear strength –static loading	Annex A	3	
0	Cyclic compression	Annex B	2	
0	Shear strength –cyclic loading	EN 13286-7	3	
4.3.14	Chemical content	EN 13055-2	1	
4.3.15	Freezing and thawing resistance	EN 13055-2:2004, Annex B	3	
4.3.16	Release of dangerous substances	Test method not yet available	-	
4.4.1	Crushing resistance	EN 13055-1:2002, Annex A	3	

## 6 Designation code

A designation code for the product shall be given by the manufacturer. The following shall be included except when there is no requirement for a property described in 4.3:

	Abbreviated term
– Expanded clay LWA	Exp. clay LWA
– This EN standard number	EN 15732
– Loose bulk density	LD “i”
– Particle size	PS “i”