



**SLOVENSKI STANDARD**  
**SIST EN 13055-1:2002**  
**01-september-2002**

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**Lahki agregati - 1. del: Lahki agregati za beton, malto in injekcijsko malto**

Lightweight aggregates - Part 1: Lightweight aggregates for concrete, mortar and grout

Leichte Gesteinskörnungen - Teil 1: Leichte Gesteinskörnungen für Beton, Mörtel und Einpressmörtel

Granulats légers - Partie 1: Granulats légers pour bétons et mortiers et coulis

**Ta slovenski standard je istoveten z: EN 13055-1:2002**

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English version

Lightweight aggregates - Part 1: Lightweight aggregates for  
concrete, mortar and grout

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mortiers

Leichte Gesteinskörnungen - Teil 1: Leichte  
Gesteinskörnungen für Beton und Mörtel

This European Standard was approved by CEN on 21 March 2002.

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 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 Management Centre has the same status as the official versions.

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

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

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

Contents

	page
Foreword.....	3
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions .....	5
4 Physical requirements.....	6
5 Chemical requirements .....	8
6 Testing .....	9
7 Evaluation of conformity.....	10
8 Designation.....	11
Annex A (normative) Determination of crushing resistance .....	12
Annex B (normative) Determination of resistance to disintegration .....	16
Annex C (normative) Determination of resistance to freezing and thawing of lightweight aggregates .....	18
Annex D (informative) Guidance on how to convert quantities by mass to quantities by volume.....	21
Annex E (informative) Guidance on the effects of some chemical constituents of lightweight aggregates on the durability of concrete, mortar and grout in which they are incorporated .....	22
Annex F (normative) Factory production control .....	23
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives .....	28

## Foreword

This document EN 13055-1:2002 has been prepared by Technical Committee CEN/TC 154 "Aggregates", the secretariat of which is held by BSI.

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 2002, and conflicting national standards shall be withdrawn at the latest by June 2004.

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 forms part of a series of standards for lightweight aggregates, the other part being:

*Part 2: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications excluding concrete, mortar and grout*

Requirements for other types of aggregates will be specified in the following European Standards:

prEN 12620, *Aggregates for concrete.*

prEN 13043, *Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.*

prEN 13139, *Aggregates for mortar.*

prEN 13242, *Aggregates for unbound and hydraulic bound materials for use in civil engineering work and road construction.*

EN 13383-1, *Armourstone - Part 1: Specification.*

prEN 13450, *Aggregates for railway ballast.*

The annexes A, B, C and F are normative, the annexes D and E are informative.

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

## 1 Scope

This European Standard specifies the properties of lightweight aggregates and lightweight filler aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates for use in concrete, mortar and grout in buildings, roads and civil engineering works.

This European Standard covers lightweight aggregates of mineral origin having particle densities not exceeding  $2\,000\text{ kg/m}^3$  ( $2,00\text{ Mg/m}^3$ ) or loose bulk densities not exceeding  $1\,200\text{ kg/m}^3$  ( $1,20\text{ Mg/m}^3$ ) including:

- a) natural aggregates;
- b) aggregates manufactured from natural materials and/or from by-products of industrial processes;
- c) by-products of industrial processes;
- d) recycled aggregates.

It provides for the evaluation of conformity of the products to this European Standard.

The requirements specified in this standard may not be relevant to all types of lightweight aggregates. For particular applications the requirements and tolerances may be adapted for the end use.

NOTE The requirements in this European Standard are based upon experience with aggregate types with an established pattern of use. Care should be taken when considering the use of aggregates from sources with no such pattern of use, e.g., recycled aggregates and aggregates arising from certain industrial by-products. Such aggregates, which should comply with all the requirements of this European Standard, could have other characteristics not included in Mandate M 125 that do not apply to the generality of aggregate types with an established pattern of use and when required, provisions valid at the place of use can be used to assess their suitability.

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## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

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: Methods for reducing laboratory samples.*

EN 932-5, *Tests for general properties of aggregates — Part 5: Common equipment and calibration.*

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

EN 933-2, *Tests for geometrical properties of aggregates — Part 2: Determination of particle size distribution — Test sieves, nominal size of apertures.*

EN 933-5, *Tests for geometrical properties of aggregates — Part 5: Determination of percentage of crushed and broken surfaces in coarse aggregate particles.*

EN 933-10, *Tests for geometrical properties of aggregates — Part 10: Assessment of fines — Grading of fillers (air jet sieving).*

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

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 1744-1:1998, *Tests for chemical properties of aggregates — Part 1: Chemical analysis.*

ISO 3310-1, *Test sieves - Technical requirements and testing — Part 1: Test sieves of metal wire cloth.*

ISO 3310-2, *Test sieves - Technical requirements and testing — Part 2: Test sieves of perforated metal plate.*

### 3 Terms and definitions

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

#### 3.1

##### **aggregate**

granular material used in construction. Aggregate may be natural, manufactured, by-product or recycled

#### 3.2

##### **lightweight aggregate**

aggregate of mineral origin having a particle density not exceeding  $2\,000\text{ kg/m}^3$  ( $2,00\text{ Mg/m}^3$ ) or a loose bulk density not exceeding  $1\,200\text{ kg/m}^3$  ( $1,20\text{ Mg/m}^3$ )

#### 3.3

##### **natural aggregate**

aggregate from mineral sources which has been subjected to nothing more than mechanical processing

#### 3.4

##### **manufactured aggregate**

aggregate of mineral origin resulting from an industrial process involving thermal or other modification

#### 3.5

##### **by-product aggregate**

aggregate of mineral origin from an industrial process which subsequently has been subjected to nothing more than mechanical processing

#### 3.6

##### **recycled aggregate**

aggregate resulting from processing of inorganic material previously used in construction

#### 3.7

##### **finest**

particle size fraction of an aggregate which passes the 0,063 mm sieve

#### 3.8

##### **filler aggregate**

aggregate, most of which passes a 0,063 mm sieve, which can be added to construction materials to provide certain properties

#### 3.9

##### **grading**

particle size distribution expressed as the percentage by mass passing a specified number of sieves

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## 4 Physical requirements

### 4.1 General

The necessity for testing and declaring all properties specified in this clause shall be limited according to the particular application at end use or origin of the aggregate. When required, the tests specified shall be carried out to determine appropriate physical properties.

### 4.2 Density

#### 4.2.1 Loose bulk density

Loose bulk density shall be declared and determined in accordance with EN 1097-3. It shall be in the range of  $\pm 15\%$  with a maximum of  $\pm 100 \text{ kg/m}^3$  ( $0,10 \text{ Mg/m}^3$ ) of the declared value.

NOTE The container should be filled using a standard scoop held centrally over the container and without touching it.

#### 4.2.2 Particle density

When required the particle density 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  $\pm 150 \text{ kg/m}^3$  ( $0,15 \text{ Mg/m}^3$ ) of the declared value.

### 4.3 Aggregate size

#### 4.3.1 General

Aggregate sizes shall be designated using a pair of sieve sizes selected from the basic set, or the basic set plus set 1, or the basic set plus set 2 in Table 1.

NOTE This designation accepts the presence of some particles which are retained on the upper sieve (oversize) and some which pass the lower sieve (undersize).

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Table 1 — Sieve sizes for specifying aggregate product sizes

Basic set mm	Basic set plus set 1 mm	Basic set plus set 2 mm
0	0	0
0,25	0,25	0,25
0,5	0,5	0,5
1	1	1
2	2	2
-	2,8 (3)	3,15 (3)
4	4	4
-	5,6 (5)	-
-	-	6,3 (6)
8	8	8
-	-	10
-	11,2 (11)	-
-	-	12,5 (12)
-	-	14
16	16	16
-	-	20
-	22,4 (22)	-
31,5 (32)	31,5 (32)	31,5 (32)
-	-	40
-	45	-
63	63	63

NOTE Rounded sizes shown in parentheses can be used as simplified descriptions of aggregate sizes.

#### 4.3.2 Undersize

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The quantity of the undersize shall not exceed 15 % by mass.

#### 4.3.3 Oversize

The quantity of the oversize shall not exceed 10 % by mass. When required, the sieve which 100 % material passes shall be declared.

#### 4.4 Grading

Particle size distribution shall be determined in accordance with EN 933-1 by dry sieving and the results declared.

NOTE Care should be taken with friable aggregates to prevent degradation.

#### 4.5 Particle shape

When required, particle shape shall be described and declared.

NOTE Test methods for normal weight aggregates are not applicable.

#### 4.6 Fines

When required, the content of fines in lightweight aggregates shall be determined in accordance with EN 933-1 and the results declared.

NOTE Care should be taken with friable aggregates to prevent degradation.

#### 4.7 Grading of fillers

When required, the particle size distribution of fillers shall be determined in accordance with EN 933-10 and the results declared.

#### 4.8 Water absorption

When required, the water absorption of lightweight aggregate shall be determined in accordance with EN 1097-6:2000, annex C and the results declared.

#### 4.9 Water content

When required the water content of the lightweight aggregate shall be determined in accordance with EN 1097-5 and the results declared.

#### 4.10 Crushing resistance

When required, the crushing resistance of lightweight aggregates shall be determined in accordance with annex A and the results declared.

NOTE There is no simple relationship between the crushing resistance of lightweight aggregate and the properties at its end use.

#### 4.11 Percentage of crushed particles

When required, the percentage of crushed particles of lightweight aggregate with a bulk density of not less than  $150 \text{ kg/m}^3$  ( $0,15 \text{ Mg/m}^3$ ) shall be determined in accordance with EN 933-5 and the results declared.

NOTE For manufactured lightweight aggregates having a bulk density less than  $150 \text{ kg/m}^3$  ( $0,15 \text{ Mg/m}^3$ ), the test specified in EN 933-5 can be used where appropriate.

#### 4.12 Resistance to disintegration

When required, the resistance to disintegration shall be determined in accordance with annex B and declared.

NOTE This test is suitable for aggregate with bulk density above  $150 \text{ kg/m}^3$  ( $0,15 \text{ Mg/m}^3$ ).

#### 4.13 Freezing and thawing resistance

If frost resistant aggregates are required for use in concrete, mortar or grout in an environment subject to freezing and thawing, the freeze/thaw resistance of aggregates having a particle size of not less than 4 mm and a density not less than  $150 \text{ kg/m}^3$  ( $0,15 \text{ Mg/m}^3$ ) shall be determined in accordance with annex C and declared.

When the resistance to freezing and thawing of aggregates of 4 mm or less and a density less than  $150 \text{ kg/m}^3$  ( $0,15 \text{ Mg/m}^3$ ) is required in the end use situation, it shall be derived from a freeze-thaw test on the final product in accordance with the provisions valid at the place of use and the results declared.

NOTE Alternatively aggregates can be assessed on the basis of satisfactory service record of performance or test on the final product.

### 5 Chemical requirements

#### 5.1 General

The necessity for testing and declaring all properties in this clause is limited to the particular application at end use or origin of the aggregate. When required the tests specified in clause 5 shall be carried out to determine the appropriate chemical content by mass. If comparing a determination to a limiting value the chemical content by mass shall be converted to a comparison value in accordance with the following equation:

$$V_c = V_m \cdot \frac{\text{Loose bulk density}}{1500}$$

where

- $V_c$  is the comparison value;  
 $V_m$  is the value measured in accordance with EN 1744-1;  
 1 500 is the assumed nominal loose bulk density of normal weight aggregate.

NOTE 1 Further guidance is given in annex D.

NOTE 2 Guidance on the effect of chemical constituents in lightweight aggregates, including alkali-silica reactivity, related to the durability, appearance and surface properties of the concrete, mortar and grout in which they are incorporated is given in annex E.

## 5.2 Chloride

The water-soluble chloride ion content of lightweight aggregates shall be provided and determined in accordance with EN 1744-1:1998, clause 7, and declared.

NOTE Further guidance is given in annex E.

## 5.3 Sulfur containing compounds

### 5.3.1 Acid-soluble sulfate

Acid-soluble sulfate content shall be determined in accordance with EN 1744-1:1998, clause 12, and declared.

### 5.3.2 Total sulfur

Total sulfur content shall be determined in accordance with EN 1744-1:1998, clause 11, and declared.

## 5.4 Loss on ignition (for ashes only)

Loss on ignition shall be determined in accordance with EN 1744-1:1998, clause 17, and declared.

## 5.5 Organic contaminators

Harmful components in natural lightweight aggregates i.e., those which alter the rate of setting and hardening of concrete, mortar and grout shall be determined in accordance with EN 1744-1:1998, 15.3, and declared.

NOTE Further guidance is given in annex E.

## 5.6 Alkali-silica reactivity of natural lightweight aggregates

When required, the alkali-silica reactivity of natural lightweight aggregates shall be assessed in accordance with the provisions valid in the place of use and the results declared.

NOTE Guidance on the effects of alkali-silica reactivity, is given in annex E.

## 6 Testing

### 6.1 Sampling

Sampling shall be carried out as specified in EN 932-1.

NOTE To ensure a representative sample care should be taken to avoid segregation.

## 6.2 Quantity of test portions

The test portion quantity specified in test methods shall, if not taken into account by the test method, be corrected on the basis of loose bulk density in order to have a volume equivalent to an aggregate with a loose bulk density of  $1\,500\text{ kg/m}^3$  ( $1,50\text{ Mg/m}^3$ ).

## 6.3 Preparation of test specimens

### 6.3.1 Drying

Test specimens shall be dried in accordance with EN 1097-5.

### 6.3.2 Conditioning after drying

Test specimens shall be allowed to cool to room temperature. For some lightweight aggregates the test specimens shall be allowed to condition to moisture equilibrium at  $(23 \pm 5)^\circ\text{C}$  and  $(50 \pm 10)\%$  RH.

## 7 Evaluation of conformity

### 7.1 General

The producer shall undertake initial type tests (see 7.2) and factory production control (see 7.3) to ensure that the product conforms to this European Standard and to declared values as appropriate.

### 7.2 Initial type tests

Initial type tests relevant to the intended end use shall be carried out to check compliance with specified requirements in the following circumstances:

- a) a new source of aggregates is to be used;
- b) there is a major change in the nature of the raw materials or in the processing conditions which may affect the properties of the aggregates.

The results of the initial tests shall be documented as the starting point of the factory production control for that material. This shall particularly include the identification of any components likely to emit radiation above normal background levels, any components likely to release polyaromatic carbons or other dangerous substances. If the content of any of these components exceeds the limits in force according to the provisions valid in the place of use of the aggregate, the results of the initial tests shall be declared.

### 7.3 Factory production control

The producer shall have in place a system of factory production control that complies with the requirements of annex F.

The records held by the producer shall indicate what control procedures are in operation during the production of the aggregate.

NOTE The form of control applied to any aggregate depends upon its intended use and the regulations relating to that use.