# SLOVENSKI STANDARD
# SIST EN 13055:2016

**01-oktober-2016**

**Nadomešča:**
**SIST EN 13055-1:2002**
**SIST EN 13055-1:2002/AC:2004**
**SIST EN 13055-2:2004**

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**Lahki agregati**

Lightweight aggregates

Leichte Gesteinskörnungen

Granulats légers



**Ta slovenski standard je istoveten z:** **EN 13055:2016**

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**ICS:**

| | | |
|---|---|---|
| 91.100.15 | Mineralni materiali in izdelki | Mineral materials and products |

**SIST EN 13055:2016** **en,fr,de**

EUROPEAN STANDARD

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# EN 13055

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English Version

# Lightweight aggregates

Granulats légers

Leichte Gesteinskörnungen

This European Standard was approved by CEN on 18 March 2016.

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

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## European foreword

This document (EN 13055:2016) 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of an identical text or by endorsement, at the latest by November 2016, and conflicting national standards shall be withdrawn at the latest by February 2018.

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 supersedes EN 13055-1:2002 and EN 13055-2:2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports basic work requirements of EU Regulation.

For relationship with EU Regulation see informative Annex ZA, which is an integral part of this document.

The most significant changes compared to the previous editions include:



a) Merging of the former 2 parts and simplifying the title of the standard;

b) Amending terminology and Annex ZA to be consistent with the Construction Products Regulation;



c) Clarifying the scope of the standard to cover construction products only;

d) Adding a new normative Annex A dealing with all source materials considered to be within the scope;

e) Referring certain recycled aggregates and MIBA to other aggregate standards (same product family);

f) Referring certain LWA for specific applications to other aggregate standards in a new normative Annex B;

g) Replacement of 3 former test method annexes with normative references to new, separate EN test method standards;

h) Reorganisation and alignment of text in subclauses under Clause 5 Product characteristics;

i) Adding a new general clause on dangerous substances;

j) Replacement of former clause on Evaluation of Conformity, and the normative text from the former annex on Factory Production Control, with new normative clauses on Assessment and Verification of Constancy of Performance;

k) Adding a new informative Annex D describing a test method for determination of water absorption for fine LWA.

No changes to existing technical classes and/or threshold levels have been made.

Characteristics for other aggregates are specified in the following European Standards:

— EN 12620, *Aggregates for concrete,*

— EN 13043, *Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas,*

— EN 13139, *Aggregates for mortar,*

— EN 13242, *Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction,*

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

— EN 13450, *Aggregates for railway ballast.*

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.

# 1 Scope

This European Standard specifies the properties of Lightweight Aggregates (LWA) and fillers derived thereof obtained by processing natural or manufactured materials and mixtures of these aggregates for concrete, mortar and grout, bituminous mixtures and surface treatments and for unbound and hydraulically bound applications in construction works.

This European Standard covers LWA of mineral origin having particle densities not exceeding 2000 kg/m³ (2,000 Mg/m³) or loose bulk densities not exceeding 1200 kg/m³ (1,200 Mg/m³) including:

a) natural LWA;

b) LWA manufactured from natural materials;

c) LWA manufactured from by-products of industrial processes or from recycled source materials;

d) LWA as by-products of industrial processes.

A list of source materials and specific materials, which are within the scope of this standard, is given in Annex A (normative).

NOTE Recycled aggregates from construction and demolition waste and Municipal Solid Waste Incinerator Bottom Ash (MIBA) are covered by EN 12620, EN 13043, EN 13139 and EN 13242.

Some LWA for specific applications are covered in separate European product Standards (Annex B, normative).



The requirements specified in this European Standard may not be equally relevant to all types of LWA. For particular applications, the requirements and tolerances can be adapted for the end use.



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

EN 1097-1, *Tests for mechanical and physical properties of aggregates — Part 1: Determination of the resistance to wear (micro-Deval)*

EN 1097-2, *Tests for mechanical and physical properties of aggregates — Part 2: Methods for the determination of resistance to fragmentation*

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

EN 1097-4, *Tests for mechanical and physical properties of aggregates — Part 4: Determination of the voids of dry compacted filler*

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

EN 1097-8, *Tests for mechanical and physical properties of aggregates — Part 8: Determination of the polished stone value*

EN 1097-9, *Tests for mechanical and physical properties of aggregates — Part 9: Determination of the resistance to wear by abrasion from studded tyres - Nordic test*

EN 1097-10, *Tests for mechanical and physical properties of aggregates — Part 10: Determination of water suction height*

EN 1097-11, *Tests for mechanical and physical properties of aggregates — Part 11: Determination of compressibility and confined compressive strength of lightweight aggregates*

EN 1367-5, *Tests for thermal and weathering properties of aggregates — Part 5: Determination of resistance to thermal shock*



EN 1367-7, *Tests for thermal and weathering properties of aggregates — Part 7: Determination of resistance to freezing and thawing of Lightweight aggregates*

EN 1367-8, *Tests for thermal and weathering properties of aggregates — Part 8: Determination of resistance to disintegration of Lightweight Aggregates*



EN 1744-1 *Tests for chemical properties of aggregates — Part 1: Chemical analysis*

EN 1744-3, *Tests for chemical properties of aggregates — Part 3: Preparation of eluates by leaching of aggregates*

EN 12664, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Dry and moist products of medium and low thermal resistance*

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 12697-11, *Bituminous mixtures — Test methods for hot mix asphalt — Part 11: Determination of the affinity between aggregate and bitumen*

EN 13179-1, *Tests for filler aggregate used in bituminous mixtures — Part 1: Delta ring and ball test*

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

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

## 3 Terms and definitions

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

**3.1**
**lightweight aggregate**
granular material of mineral origin having a particle density not exceeding 2000 kg/m³ (2,00 Mg/m³) or a loose bulk density not exceeding 1200 kg/m³ (1,20 Mg/m³). Lightweight aggregate can be natural, manufactured from natural sources, manufactured from by-products or recycled source materials and by-product aggregates

**3.2**
**natural lightweight aggregate**
aggregate from mineral sources which has been subjected to nothing more than mechanical processing

**3.3**
**manufactured lightweight aggregate**
aggregate of mineral origin resulting from an industrial process involving thermal or other modification

**3.4**
**by-product lightweight aggregate**
aggregate of mineral origin from an industrial process which subsequently has been subjected to nothing more than mechanical processing



**3.5**
**recycled source material**
raw material of inorganic or mineral origin from waste sources for use in manufactured LWA



**3.6**
**recycled aggregate**
aggregate resulting from processing of inorganic or mineral material previously used in construction

**3.7**
**fine lightweight aggregate (fines)**
designation given to the smaller aggregate size with d equal to or greater than 0 mm and D less than or equal to 4 mm

**3.8**
**coarse lightweight aggregate**
designation given to the larger aggregate size with d equal to or greater than 2 mm and D greater than 4 mm

**3.9**
**all in lightweight aggregate**
designation given to the aggregate size with d equal to or greater than 0 mm and D greater than 4 mm

**3.10**
**lightweight aggregate filler**
fine lightweight aggregate, most of which passes a 0,063 mm sieve

**3.11**
**grading**
particle size distribution expressed as the percentage by mass passing a specified number of sieves

**3.12**
**aggregate size**
designation of aggregate in terms of lower sieve (d) and upper sieve (D) sizes expressed as d/D

Note 1 to entry: The designation accepts the presence of some particles which are retained on the upper sieve (oversize) and some particles which pass the lower sieve (undersize).

**3.13**
**constant mass**
successive weightings after drying and conditioning at least 1 h apart not differing by more than 0,1 %

**3.14**
**declared value**
value that a manufacturer is confident in achieving, taking into account the precision of test methods used, the variability of the production process(es) and the product performance

## 4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

| | |
|---|---|
| CWFT | Classification Without Further Testing |
| d | lower sieve size |
| D | upper sieve size |
| DoP | Declaration of Performance |
| FPC | Factory production control |
| LWA | lightweight aggregate(s) |
| PSV | polished stone value |



## 5 Product characteristics

### 5.1 General

The necessity for testing and declaring all characteristics 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 characteristics.

### 5.2 Density

#### 5.2.1 Loose bulk density

The loose bulk density shall be determined in accordance with EN 1097-3 and a value declared. Measured values shall be in the range of ± 15 % with a maximum of ± 100 kg/m³ (0,100 Mg/m³) of the declared value.

NOTE It is advised to fill the container using a standard scoop held centrally over the container and without touching it.

#### 5.2.2 Particle density

When required, the particle density shall be determined in accordance with EN 1097-6 and a value declared. Measured values shall be in the range of ± 15 % with a maximum of ± 150 kg/m³ (0,150 Mg/m³) of the declared value.

NOTE This test method may not be applicable to all LWA having a bulk density of less than 150 kg/m³ (0,150 Mg/m³).

## 5.3 Aggregate size

### 5.3.1 General

Aggregate sizes shall be determined 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 specified in Table 1 and the upper and lower sizes declared as product designation.

NOTE The declaration accepts the presence of some particles, which will be retained on the upper sieve (referred to as (D)) and some, which will pass the lower sieve (referred to as (d)).

**Table 1 — Sieve sizes for specifying aggregate 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 Figures in parenthesis can be used to provide simplified descriptions of aggregate sizes. | | |



### 5.3.2 Undersize

The quantity of the undersize passing the lower sieve (d) shall not exceed 15 % by mass.

### 5.3.3 Oversize

The quantity of the oversize retained on the upper sieve (D) shall not exceed 10 % by mass. When required, the sieve through which 100 % of the aggregate passes shall be declared.

## 5.4 Grading

When required, the particle size distribution shall be determined in accordance with EN 933-1 without washing and a grading declared.

NOTE It is advised to take care with friable aggregates to prevent degradation.

## 5.5 Content of fines in LWA

When required, the content of fines in LWA shall be determined in accordance with EN 933-1 without washing and a value declared.

NOTE It is advised to take care with friable aggregates to prevent degradation.

## 5.6 Grading of LWA filler

When required, the particle size distribution of LWA filler shall be determined in accordance with EN 933-10 and a grading declared.

## 5.7 Particle shape

When required, particle shape shall be described.

NOTE The test methods for normal weight aggregates are not applicable to LWA.

## 5.8 Water content



When required, the water content of LWA shall be determined in accordance with EN 1097-5 and a value declared.



## 5.9 Water absorption



When required, the water absorption of coarse LWA shall be determined in accordance with EN 1097-6 and a value declared.

NOTE EN 1097-6 is not an appropriate test method for fine LWA. Water absorption of fine LWA can be determined in accordance with Annex D.

## 5.10 Bulk crushing resistance

When required, the bulk crushing resistance of LWA shall be determined in accordance with Annex C and a value declared.

NOTE 1 There is no simple relationship between the bulk crushing resistance of LWA and the properties at its end use.

NOTE 2 The bulk crushing resistance is intended only for factory production control and quality documentation.

## 5.11 Crushed particles

When required, the presence of crushed particles shall be described.

NOTE The test methods for normal weight aggregates are not applicable to LWA.

## 5.12 Resistance to disintegration

When required, the resistance to disintegration of LWA shall be determined in accordance with EN 1367-8 and a value declared.

NOTE This test method may not be applicable to all LWA having a bulk density of less than 150 kg/m³ (0,150 Mg/m³).

## 5.13 Freezing and thawing resistance

When required, and in accordance with the provisions valid in the place of use, the resistance to freezing and thawing of LWA used in exposed hydraulically and unbound applications (U4 in Table A.1) having a particle size of not less than 4 mm and a bulk density of not less than 150 kg/m³ (0,150 Mg/m³) shall be determined in accordance with EN 1367-7 and a value declared.

When the resistance to freezing and thawing of LWA of 4 mm or less or a bulk density of less than 150 kg/m³ (0,150 Mg/m³) is required in the end use situation, it shall be derived from freeze-thaw tests on the final product in accordance with the provisions valid in the place of use.

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

## 5.14 Water suction height

When required, the water suction height of LWA shall be determined in accordance with EN 1097-10 and a value declared.

## 5.15 Compressibility and confined compressive strength

When required, the compressibility and confined compressive strength of LWA shall be determined in accordance with EN 1097-11 and values declared.



NOTE This test method developed for LWA having a bulk density of not less than 150 kg/m³ (0,150 Mg/m³) has not been fully evaluated with all types of LWA.

## 5.16 Resistance to cyclic compressive loading



When required, the resistance to cyclic compressive loading of LWA shall be determined in accordance with EN 13286-7 and a value declared.

NOTE This test method may not be applicable to all LWA.

## 5.17 Stiffening properties

When required, the stiffening properties of LWA filler in bituminous mixtures shall be determined in accordance with EN 13179-1 and a value declared.

## 5.18 Voids of dry compacted LWA filler

When required the voids of dry compacted LWA filler shall be determined in accordance with EN 1097-4 and a value declared.

NOTE This test method may not be applicable to all LWA.

## 5.19 Resistance to thermal shock

When required the resistance to thermal shock of LWA shall be determined in accordance with EN 1367-5 and a value declared.

NOTE This test method may not be applicable to all LWA.

## 5.20 Resistance to polishing

When required the polished stone value (PSV) of coarse LWA shall be determined in accordance with EN 1097-8 and a value declared.