SLOVENSKI STANDARD

SIST EN 13055-2:2004

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Lahki agregati – 2. del: Lahki agregati za bitumenske zmesi in površinske prevleke ter za uporabo v nevezanih in vezanih mešanicah

Lightweight aggregates - Part 2: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications

Leichte Gesteinskörnungen - Teil 2: Leichte Gesteinskörnungen für Asphalte und Oberflächenbehandlungen sowie für ungebundene und gebundene Verwendung

Granulats légers - Partie 2 : Granulats légers pour mélanges hydrocarbonés, enduits superficiels et pour utilisation en couches traitées et non traitées

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EUROPEAN STANDARD

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English version

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This European Standard was approved by CEN on 23 April 2004.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

page

Foreword

This document (EN 13055:2:2004) 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of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

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 annex ZA, which is an integral part of this document.

Annexes A, B and C are normative. Annex D is informative.

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

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

Requirements for other end uses of aggregates will be 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies the properties of lightweight aggregates and fillers derived thereof obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates for bituminous mixtures and surface treatments and for unbound and hydraulically bound applications other than concrete, mortar and grout.

This European Standard covers lightweight aggregates of mineral origin having particle densities not exceeding 2000 kg/m^3 (2,00 Mg/m^3) or loose bulk densities not exceeding 1200 kg/m^3 (1,20 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 can be adapted for the end use.

NOTE Aggregates used in construction should comply with all the requirements of this European Standard. As well as familiar and traditional natural and manufactured aggregates Mandate M/125 "Aggregates" included recycled aggregates and some materials from new or unfamiliar sources. Recycled aggregates are included in the standards and new test methods for them are at an advanced stage of preparation. For unfamiliar materials from secondary sources, however, the work on standardization has only started recently and more time is needed to define clearly the origins and characteristics of these materials. In the meantime such unfamiliar materials when placed on the market as aggregates should comply fully with this standard and national regulations for dangerous substances (see annex ZA) depending upon their intended use. Additional characteristics and requirements can be specified on a case by case basis depending upon experience of use of the product, and defined in specific contractual documents.

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 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 1097-4, *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 1097-6:2000, *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 1367-5, *Tests for thermal and weathering properties of aggregates — Part 5: Determination of resistance to thermal shock.*

EN 1744-1:1998, *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 13055-1:2002, *Lightweight aggregates — Part 1: Lightweight aggregates for concrete, mortar and grout.*

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 - Procedures for determining declared and design thermal values (ISO 10456:1999).*

3 Terms, definitions and abbreviations

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

3.1
aggregate
granular material used in construction. Aggregate can be natural, manufactured or recycled

3.2
lightweight aggregate (LWA)
aggregate of mineral origin having a particle density not exceeding 2000 kg/m^3 (2 Mg/m^3) or a loose bulk density not exceeding 1200 kg/m^3 (1,20 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
fines
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
lightweight aggregate filler
filler derived from lightweight aggregate

3.10
grading
particle size distribution expressed as the percentage by mass passing a specified number of sieves

3.11
constant mass
successive weighing after drying and conditioning at least 1 h apart not differing by more than 0,1 %

NOTE In many cases constant mass can be achieved after a test portion has been dried for a pre-determined period in a specified oven at (110 ± 5) °C. Test laboratories can determine the time required to achieve constant mass for specific types and sizes of sample dependent upon the drying capacity of the oven used.

4 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 properties.

4.2 Density

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

4.2.1 Loose bulk density

When required loose bulk density of LWA and LWA fillers shall be determined in accordance with EN 1097-3 and declared. It shall be in the range of ± 15 % with a maximum of ± 100 kg/m^3 (0,10 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 of LWA shall be determined in accordance with EN 1097-6:2000, annex C and declared. It shall be in the range of ± 15 % with a maximum of ± 150 kg/m^3 (0,15 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 specified in Table 1.

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

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 Figures in parenthesis can be used to provide simplified descriptions of aggregate product sizes.

4.3.2 Undersize

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

4.3.3 Oversize

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

4.4 Grading

The particle size distribution of LWA shall be determined in accordance with EN 933-1 without washing and declared.

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

4.5 Particle shape

When required particle shape of LWA 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 LWA shall be determined in accordance with EN 933-1 without washing and declared.

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

4.7 Grading of LWA filler

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

4.8 Water content

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

4.9 Water absorption

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

4.10 Bulk crushing resistance

When required the bulk crushing resistance of LWA shall be determined in accordance with EN 13055-1:2002, annex A and declared.

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

4.11 Percentage of crushed particles

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

4.12 Resistance to disintegration

When required the resistance to disintegration for LWA with bulk density of not less than 150 kg/m^3 (0,15 Mg/m^3) shall be determined in accordance with EN 13055-1:2002, annex B and declared.

4.13 Freezing and thawing resistance

When required the resistance to freezing and thawing of LWA used in exposed hydraulically unbound applications having a particle size of not less than 4 mm and a bulk density of not less than 150 kg/m^3 (0,15 Mg/m^3) shall be determined in accordance with annex B and declared.

When the resistance to freezing and thawing of aggregates of 4 mm or less (e.g. LWA fillers) or a density of less than 150 kg/m^3 (0,15 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.

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

4.14 Water suction height

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

4.15 Compaction and load bearing capacity

When required the compaction and load bearing capacity of LWA shall be determined in accordance with annex A and declared.

NOTE This test method developed for LWA having a bulk density of not less than 150 kg/m^3 (0,15 Mg/m^3) has not been fully evaluated with all types of lightweight aggregates.

4.16 Resistance to cyclic compressive loading

When required the resistance to cyclic compressive loading of LWA with bulk density of not less than 150kg/m^2 (0,15 Mg/m^3) shall be determined in accordance with EN 13286-7 and declared.

NOTE This test method developed primarily for normal weight aggregates has not been evaluated for its suitability for LWA to establish a pattern of use.

4.17 Stiffening properties

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

4.18 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 declared.

NOTE The test method developed primarily for normal weight aggregates has not been evaluated for its suitability for LWA to establish a pattern of use.

4.19 Resistance to thermal shock

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

4.20 Resistance to polishing

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

NOTE The test method developed primarily for normal weight aggregates has not been evaluated for its suitability for LWA to establish a pattern of use.

4.21 Resistance to wear by abrasion from studded tyres of coarse LWA in surface treatments

When required the resistance to abrasion from studded tyres (Nordic test) shall be determined in accordance with EN 1097-9 and declared.

NOTE The test method developed primarily for normal weight aggregates has not been evaluated for its suitability for LWA to establish a pattern of use.

4.22 Compatibility between LWA and bitumen

When required the compatibility of coarse LWA to bitumen shall be determined in accordance with EN 12697-11 and declared.

NOTE The test method developed primarily for normal weight aggregates has not been evaluated for its suitability for LWA to establish a pattern of use.

4.23 Chemical requirements

4.23.1 General

The necessity for testing and declaring all properties in this clause is limited to particular application at end use or origin of the aggregate. When required the tests specified in 4.23 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:

$$V_c = V_m \; x \; \frac{\text{loose bulk density}}{1500}$$

where:

V_c is the comparison value;

V_m is the value measured in accordance with EN 1744-1;

1500 is the assumed nominal loose bulk density of normal weight aggregate.

NOTE Further guidance is given in annex D.

4.23.2 Water solubility

When required the water solubility of LWA filler used in bituminous mixtures shall be determined in accordance with EN 1744-1: 1998, clause 16, and declared.

4.23.3 Loss on ignition (for ashes only)

The loss on ignition shall be determined in accordance with EN 1744-1 and declared.