



SLOVENSKI STANDARD
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Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction

Gesteinskörnungen für ungebundene und hydraulisch gebundene Gemische für den Ingenieur- und Straßenbau

iTeh STANDARD PREVIEW

Granulats pour matériaux traités aux liants hydrauliques et matériaux non traités utilisés pour les travaux de génie civil et pour la construction des chaussées

[SIST EN 13242:2003+A1:2008](https://standards.iteh.ai/catalog/standards/sist/f0f82361-d50f-4c00-ae5b-659766c3552f/sist-en-13242-2003-a1-2008)

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English Version

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This European Standard was approved by CEN on 23 September 2002 and includes Corrigendum 1 issued by CEN on 26 May 2004 and Amendment 1 approved by CEN on 3 November 2007.

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

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Contents

	page
Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	5
4 Geometrical requirements	6
4.1 General.....	6
4.2 Aggregates sizes	6
4.3 Grading	7
4.4 Shape of coarse aggregate.....	10
4.5 Percentage of crushed or broken particles and of totally rounded particles in coarse aggregates	10
4.6 Fines content.....	11
4.7 Fines quality.....	12
5 Physical requirements	12
5.1 General.....	12
5.2 Resistance to fragmentation of coarse aggregate	12
5.3 Resistance to wear of coarse aggregate	13
5.4 Particle density	14
5.5 Water absorption	14
5.6 A1 Classification of the constituents of coarse recycled aggregates	14
6 Chemical requirements	15
6.1 General.....	15
6.2 Acid-soluble A1 sulfate A1	15
6.3 Total sulfur	16
7 Durability requirements	18
7.1 General.....	18
7.2 "Sonnenbrand" of basalt	19
7.3 Resistance to freezing and thawing.....	20
8 Evaluation of conformity.....	21
8.1 General.....	21
8.2 Initial type tests.....	21
8.3 Factory production control.....	22
9 Designation and description	22
9.1 Designation	22
9.2 Additional information for the description of an aggregate.....	22
10 Marking and labelling	22
Annex A (normative) Assessment of fines	23
Annex B (informative) Notes for guidance on the freezing and thawing resistance of aggregates	24
Annex C (normative) Factory production control.....	26
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	32
Bibliography	41

Foreword

This document (EN 13242:2002+A1:2007) has been prepared by Technical Committee CEN/TC 154 "Aggregates", the secretariat of which is held by BSI.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2008 and conflicting national standards shall be withdrawn at the latest by September 2009.

This document includes Amendment 1, approved by CEN on 2007-11-03 and the Corrigendum issued in 2004.

This document supersedes EN 13242:2002.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A1}$ $\boxed{A1}$.

The modifications of the related CEN Corrigendum have been implemented at the appropriate places in the text and are indicated by the tags \boxed{AC} \boxed{AC} .

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 89/106 EEC.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

In this European Standard the annexes A and C are normative and the annex B is informative.

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 13055-1	Lightweight aggregates - Part 1: lightweight aggregates for concrete, mortar and grout
$\boxed{A1}$ EN 13055-2	Lightweight aggregates - Part 2: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications $\boxed{A1}$
EN 13139	Aggregates for mortar
EN 13383-1	Armourstone - Part 1: Specification
$\boxed{A1}$ EN 13450 $\boxed{A1}$	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, 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 United Kingdom.

1 Scope

This European Standard specifies the properties of aggregates obtained by processing natural or manufactured or recycled materials for hydraulically bound and unbound materials for civil engineering work and road construction.

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

AC NOTE 1 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 standardisation 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 must comply fully with this standard and national regulations for dangerous substances (see Annex ZA of the standard) depending upon their intended use. Additional characteristics and requirements may be specified on a case by case basis depending upon experience of use of the product, and defined in specific contractual documents. **AC**

NOTE 2 Properties for lightweight aggregates are specified in EN 13055-2.

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). (standards.iteh.ai)

EN 196-2, *Methods of testing cement — Part 2: Chemical analysis of cement.*

EN 932-3, *Tests for general properties of aggregates — Part 3: Procedure and terminology for simplified petrographic description.*

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 933-3, *Tests for geometrical properties of aggregates — Part 3: Determination of particle shape — Flakiness index.*

EN 933-4, *Tests for geometrical properties of aggregates — Part 4: Determination of particle shape — Shape index.*

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

EN 933-8, *Tests for geometrical properties of aggregates — Part 8: Assessment of fines — Sand equivalent test.*

EN 933-9, *Tests for geometrical properties of aggregates — Part 9: Assessment of fines — Methylene blue test.*

A1 prEN 933-11, *Tests for geometrical properties of aggregates — Part 11: Classification test for the constituents of coarse recycled aggregates* **A1**

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

EN 1097-2:1998, *Tests for mechanical and physical properties of aggregates — Part 2: Methods for the determination of the resistance to fragmentation.*

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

EN 1367-1, *Tests for thermal and weathering properties of aggregates — Part 1: Determination of resistance to freezing and thawing.*

EN 1367-2, *Tests for thermal and weathering properties of aggregates — Part 2: Magnesium sulphate test.*

EN 1367-3, *Tests for thermal and weathering properties of aggregates — Part 3: Boiling test for "Sonnenbrand" basalt.*

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.*

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings.*

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. Aggregates may be natural, manufactured or recycled

3.2

natural aggregate

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

3.3

manufactured aggregate

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

3.4

recycled aggregate

aggregate resulting from the processing of inorganic material previously used in construction

3.5

normal weight aggregate

aggregate of mineral origin having a particle density not less than 2,00 Mg/m³ (2 000 kg/m³) but less than 3,00 Mg/m³ (3 000 kg/m³)

3.6

aggregate size

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

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). The lower sieve size (d) can be zero.

3.7

fine aggregate

designation given to size aggregates with d equal to 0 and D less than or equal to 6,3 mm (see Table 2)

NOTE Fine aggregate can be produced from natural disintegration of rock or gravel and/or by the crushing of rock or gravel

or processing of manufactured aggregates.

3.8

coarse aggregate

designation given to size aggregates with d equal to or greater than 1 mm and D greater than 2 mm

3.9

all-in aggregate

aggregate consisting of a mixture of coarse and fine aggregates with D greater than 6,3 mm

NOTE It can be produced without separating into coarse and fine fractions or it can be produced by combining coarse and fine aggregate.

3.10

fines

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

3.11

category

level of a property of an aggregate expressed as a range of values or a limiting value

NOTE There is no relationship between the categories of different properties.

3.12

grading

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

3.13

undersize

part of the aggregate passing the smaller of the limiting sieves used in the aggregate size description

3.14

oversize

part of the aggregate retained on the larger of the limiting sieves used in the aggregate size description

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4 Geometrical requirements

4.1 General

The necessity for testing and declaring all properties in this clause shall be limited according to the particular application or end use or origin of the aggregate. When required, the tests specified in clause 4 shall be carried out to determine appropriate geometrical properties.

NOTE 1 When the value of a property is required but not defined by specified limits the value should be declared by the manufacturer as an XX_{Declared} category, e.g., in Table 5 a flakiness index of say 60 corresponds to F'_{60} (Declared value).

NOTE 2 When a property is not required, a "No requirement" category can be used.

NOTE 3 Guidance on selection of appropriate categories for specific applications can be found in national provisions in the place of use of the aggregate.

NOTE 4 When specified, the requirements for the end-use product should supersede the requirements in this European Standard (e.g., grading and/or fines content for all-in aggregates).

4.2 Aggregates sizes

All aggregates shall be described in terms of aggregate sizes using the designations d/D and shall comply with the grading requirements specified in 4.3.

Aggregate sizes shall be specified using the nominal sizes given in the Table 1 comprising the basic set or the basic set plus set 1 or the basic set plus set 2. A combination of sieve sizes from set 1 and set 2 is not allowed.

Aggregate sizes shall be separated by a ratio between their upper sieve size D and the lower sieve size d of not less than 1,4.

Table 1 — Sieve sizes for specifying aggregate sizes

A1

Basic set mm	Basic set plus set 1 mm	Basic set plus set 2 mm
0	0	0
1	1	1
2	2	2
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	-
-	56	-
63	63	63
-	-	80
-	90	-
NOTE 1 Greater than 90 mm sieve sizes can be used for particular applications.		
NOTE 2 Rounded sizes shown in parentheses can be used as simplified descriptions of aggregate sizes.		

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4.3 Grading

4.3.1 General

The grading of aggregate sizes when determined in accordance with EN 933-1 shall comply with the requirements of 4.3.2 and 4.3.3 as appropriate to its aggregate size d/D .

Combinations of two or more than two adjacent aggregate sizes or all-in aggregates are permitted.

NOTE Aggregate supplied as a mixture of different sizes or types should be uniformly blended. When aggregates of significantly different density are blended caution is necessary to avoid segregation.

When assessing production within a system of factory production control at least 90 % of gradings, taken on different batches within a maximum period of 6 months, shall fall within the limits specified in 4.3.2 and 4.3.3 for tolerances on manufacturers' declared typical gradings.

Table 2 — General grading requirements

Aggregate	Size mm	Percentage passing by mass					Category G
		2 D ^a	1,4 D ^{b c}	D ^d	d ^{c e}	d/2 ^{b c}	
Coarse	d ≥ 1	100	98 to 100	85 to 99	0 to 15	0 to 5	G _C 85-15
	and D > 2	100	98 to 100	80 to 99	0 to 20	0 to 5	G _C 80-20
Fine	d = 0	100	98 to 100	85 to 99	—	—	G _F 85
	and D ≤ 6,3	100	98 to 100	80 to 99	—	—	G _F 80
All-in	d = 0	—	100	85 to 99	—	—	G _A 85
		100	98 to 100	80 to 99	—	—	G _A 80
	and D > 6,3	100	—	75 to 99	—	—	G _A 75

^a For aggregate sizes where D is greater than 63 mm (e.g. 80 mm and 90 mm) only the oversize requirements related to the 1,4 D sieve apply since there is no ISO 565/R20 series sieve above 125 mm.

^b Where the sieves calculated as 1,4 D and d/2 are not exact sieve sizes in the ISO 565/R20 series then the next higher or lower sieve size respectively shall be adopted.

^c For special uses additional requirements may be specified.

^d The percentage passing D may be greater than 99 % but in such cases the manufacturer shall document and declare the typical grading including the sieves D, d, d/2 and sieves in the basic set plus set 1 or basic set plus set 2 intermediate between d and D. Sieves with a ratio less than 1,4 times the next lower sieve may be excluded.

^e Limits for the percentage passing d can be modified to 1 to 15 for G_C 85-15 and 1 to 20 for G_C 80-20 where necessary to ensure a well graded aggregate.

4.3.2 Coarse aggregate

All coarse aggregates shall comply with the general grading requirements specified in Table 2 appropriate to their size d/D.

When required, for graded coarse aggregate where D/d ≥ 2, the following additional requirements shall apply for the percentage passing the mid-size sieve:

- all gradings shall comply with the overall limits given in Table 3;
- the manufacturer shall document and, on request, declare the typical grading passing the mid-size sieve. The limit deviations shall comply with the requirements of the categories selected in Table 3 according to the particular application or end use.

For single coarse aggregate where D/d < 2, there shall be no requirement additional to those specified in Table 2.

Table 3 — Categories of overall limits and tolerances for coarse aggregate at mid-size sieves

<i>D/d</i>	Mid-size sieve mm	Overall limits and tolerances at mid-size sieves (Percentage passing by mass) where $D/d \geq 2$		Category <i>GT</i>
		Overall limits	Limit deviations on manufacturer's declared typical grading	
<4	<i>D/1,4</i>	25 to 80	± 15	$GT_{C25/15}$
		20 to 70	± 15	$GT_{C20/15}$
≥ 4	<i>D/2</i>	20 to 70	$\pm 17,5$	$GT_{C20/17,5}$
No requirement				GT_{NR}
When the mid-size sieves calculated in the above is not an exact sieve size in the ISO 565/R20 series then the nearest sieve in the series shall be used.				

4.3.3 Fine aggregate and all-in aggregate

Fine aggregates and all-in aggregates shall comply with the general grading requirements specified in Table 2.

When required, the manufacturer shall document, and on request declare, the typical grading for each fine aggregate and all-in aggregate size produced. The limit deviations shall comply with the requirements of the categories selected in Table 4 according to the particular application or end use.

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Table 4 — Categories of tolerances on manufacturer's declared typical grading of fine aggregate and all-in aggregate

Limit deviations Percentage passing by mass			Category	
<i>D</i> sieve	<i>D/2</i> sieve	0,063 mm sieve	Fine aggregate GT_F	All-in aggregate GT_A
± 5	± 10	$\pm 3^a$	GT_{F10}	GT_{A10}
± 5	± 20	$\pm 4^b$	GT_{F20}	GT_{A20}
$\pm 7,5$	± 25	$\pm 5^c$	GT_{F25}	GT_{A25}
No requirement			GT_{FNR}	GT_{ANR}
When the mid-size sieve calculated as above is not an exact sieve size in the ISO 565/R20 series, then the nearest sieve in the series shall be used.				
NOTE Limit deviations of <i>D</i> sieves are further limited by the requirements of Table 2.				
^a Except for category f_3 (see Table 8).				
^b Except for categories f_3 and f_7 for fine aggregates and f_3, f_5 and f_7 for all-in aggregates (see Table 8).				
^c Except for categories f_3 and f_7 for fine aggregates and f_3, f_5, f_7 and f_9 for all-in aggregates (see Table 8).				

4.4 Shape of coarse aggregate

When required, the shape of coarse aggregates shall be determined in terms of the flakiness index, as specified in EN 933-3. The flakiness index shall be the reference test for the determination of the shape of coarse aggregates. The flakiness index shall be declared in accordance with the relevant category specified in Table 5 according to the particular application or end use.

Table 5 — Categories for maximum values of flakiness index

Flakiness index	Category <i>FI</i>
≤ 20	<i>FI</i> ₂₀
≤ 35	<i>FI</i> ₃₅
≤ 50	<i>FI</i> ₅₀
> 50	<i>FI</i> _{Declared}
No requirement	<i>FI</i> _{NR}

Where required, the shape index, determined in accordance with EN 933-4, shall be declared in accordance with the relevant category specified in Table 6 according to the particular application or end use.

Table 6 — Categories for maximum values of shape index

Shape index	Category <i>SI</i>
≤ 20	<i>SI</i> ₂₀
≤ 40	<i>SI</i> ₄₀
≤ 55	<i>SI</i> ₅₅
> 55	<i>SI</i> _{Declared}
No requirement	<i>SI</i> _{NR}

4.5 Percentage of crushed or broken particles and of totally rounded particles in coarse aggregates

When required, the percentage of crushed or broken and of totally rounded particles in coarse aggregates, determined in accordance with EN 933-5, shall be declared in accordance with the relevant category specified in Table 7.

Aggregates obtained from crushing rock shall be assumed to be category *C*_{90/3} and do not require further testing.

Table 7 — Categories for percentage of crushed or broken particles and totally rounded particles in coarse aggregates

Mass fraction of crushed or broken particles %	Mass fraction of totally rounded particles %	Category C
90 to 100	0 to 3	$C_{90/3}$
50 to 100	0 to 10	$C_{50/10}$
50 to 100	0 to 30	$C_{50/30}$
-	0 to 50	$C_{NR/50}$
-	0 to 70	$C_{NR/70}$
Declared value	Declared value	$C_{Declared}$
No requirement	No requirement	C_{NR}

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4.6 Fines content

When required, the fines content for coarse aggregate, fine aggregate and all-in aggregate, shall be declared in accordance with the relevant category specified in Table 8.

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Table 8 — Categories for maximum values of fines content

Aggregate	Mass fraction of passing 0,063 mm sieve, %	Category f
Coarse	≤ 2	f_2
	≤ 4	f_4
	> 4	$f_{Declared}$
	No requirement	f_{NR}
Fine	≤ 3	f_3
	≤ 7	f_7
	≤ 10	f_{10}
	≤ 16	f_{16}
	≤ 22	f_{22}
	> 22	$f_{Declared}$
	No requirement	f_{NR}
All-in	≤ 3	f_3
	≤ 5	f_5
	≤ 7	f_7
	≤ 9	f_9
	≤ 12	f_{12}
	≤ 15	f_{15}
	> 15	$f_{Declared}$
	No requirement	f_{NR}