SLOVENSKI STANDARD
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Agregati za malte

Aggregates for mortar

Gesteinskörnungen für Mörtel

Granulats pour mortiers

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Aggregates for mortar

Granulats pour mortiers

Gesteinskörnungen für Mörtel

This European Standard was approved by CEN on 25 March 2002.

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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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document EN 13139 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of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by June 2004.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 89/106 EEC.

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

Requirements for other end uses 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.*
EN 13055-1, *Lightweight aggregates - Part 1: Lightweight aggregates for concrete, mortar and grout.*
prEN 13242, *Aggregates for unbound and hydraulic bound materials for use in civil engineeringwork and road construction.*
EN 13383-1, *Armourstone - Part 1: Specification.*
prEN 13450, *Aggregates for railway track ballast.*
The annexes B, C and E are normative, the annexes A, D and F 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 aggregates and filler aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates for use in mortar, e.g.,

a) masonry mortar,
b) floor/screed mortar,
c) surfacing of internal walls (plastering mortar),
d) rendering of external walls,
e) special bedding materials,
f) repair mortar,
g) grouts,

for buildings, roads and civil engineering works.

This standard does not cover filler aggregates to be used as a constituent in cement or as other than inert filler aggregates for mortars or aggregates to be used in the surface layer of industrial floors.

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

NOTE 1 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.

NOTE 2 Properties for lightweight aggregates are specified in prEN 13055-1.

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 932-5, *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 933-7, *Tests for geometrical properties of aggregates — Part 7: Determination of shell content — Percentage of shells in coarse aggregates.*

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.*

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

EN 1097-6, *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 sulfate test.*

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

ISO 565:1990, *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. Aggregate may be natural, manufactured or re-cycled

3.2
natural aggregate
aggregate from mineral sources which has been subjected to nothing more than 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
aggregate size
description of aggregate in terms of lower (*d*) and upper (*D*) sieve sizes

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).

3.6
coarse aggregate
designation given to the larger aggregate sizes with *D* greater than or equal to 4 mm and *d* greater than or equal to 2 mm

3.7
fine aggregate
designation given to the smaller aggregate sizes with *D* less than or equal to 4 mm

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 aggregate.

3.8
fines
particle size fraction of an aggregate which passes the 0,063 mm sieve

3.9
filler aggregate
aggregate, most of which passes a 0,063 mm sieve, which can be added to construction materials to provide certain properties

NOTE See 3.8 for the definition of "fines".

3.10
particle size fraction
fraction of an aggregate passing the larger of two sieves and retained on the smaller

NOTE The lower limit can be zero.

3.11
oversize
part of the aggregate retained on the larger of the limiting sieves used in aggregate size description

3.12
undersize
that part of the aggregate passing the smaller of the limiting sieves used in aggregate size description

3.13
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.

3.14
grading
particle size distribution expressed as the percentages by mass passing a specified set of sieves

3.15
batch
production quantity, a delivery quantity, a partial delivery quantity (railway wagon, load, lorry-load, ship's cargo) or a stockpile produced at one time under conditions that are presumed uniform

NOTE With a continuous process the quantity produced during a specified period should be treated as a batch.

4 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.

5 Geometrical requirements

5.1 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 in clause 5 shall be carried out to determine appropriate geometrical properties.

5.2 Aggregate sizes

5.2.1 All aggregates shall be described in terms of aggregate sizes using the designations *d/D* except for aggregates added as fillers which shall be described as filler aggregate.

5.2.2 Aggregate size shall be described by the pair of sieve sizes in millimetres with *d* as the lower limit designation and *D* as the upper limit designation sieve between which most of the particle size distribution lies, (e.g. 0/4 mm,
0/2 mm, 2/4 mm, etc.).

5.2.3 The following aggregate sizes are preferred:

0/1 mm, 0/2 mm, 0/4 mm, 0/8 mm, 2/4 mm, 2/8 mm

5.3 Grading

The grading of aggregates, determined in accordance with EN 933-1, shall conform to the following requirements as appropriate to their aggregate size (*d*/*D*).

5.3.1 Oversize and undersize limits

Aggregates sizes specified in 5.2.3 shall conform to the oversize and undersize limits given in Table 1, except where otherwise specified for special uses.

Table 1 — Oversize and undersize limits

Aggregate sizes mm	Limits in percentage passing by mass				
	Oversize			Undersize	
	2 *D* [a]	1,4 *D* [b]	*D* [c]	*d*	0,5 *d* [b]
0/1	100	95 to 100	85 to 99	-	-
0/2	100	95 to 100	85 to 99	-	-
0/4	100	95 to 100	85 to 99	-	-
0/8	100	98 to 100	90 to 99	-	-
2/4	100	95 to 100	85 to 99	0 to 20	0 to 5
2/8	100	98 to 100	85 to 99	0 to 20	0 to 5

[a] Where essential for special purposes the sieve on which 100 % passes may be specified at a value less than 2 *D*. For thin layer mortar (0/1) 100 % shall pass *D*.

[b] Where the sieves calculated as 0,5 *d* and 1,4 *D* are not exact numbers in the ISO 565:1990/R20 series the next nearest sieve size shall be adopted.

[c] If the percentage passing *D* is > 99 % by mass, the producer shall document and declare the typical grading including the sieves identified in Table 2.

5.3.2 Typical grading and tolerances

The following requirements shall be applied to control the variability of the fine aggregate.

When required the producer shall document and declare the typical grading for each fine aggregate size produced. When assessing production within a system of continuous factory production control at least 90 % of the most recent 20 results of grading shall fall within the appropriate tolerances specified in Table 2 about the declared grading.

NOTE 1 Recommendations for the description of the coarseness of the aggregates are given in annex A.

NOTE 2 The majority of fine aggregates in regular satisfactory use for most applications conform to general use grading requirements. It is not intended that special use gradings should apply except where essential for particular applications.

Table 2 — Tolerances on producers' declared typical gradings for general use aggregates

Sieve mm	Maximum tolerance in percentage passing by mass [a, b]			
	Aggregate size mm			
	0/8	0/4	0/2	0/1
8	± 5	-	-	-
4	-	± 5	-	-
2	± 10	-	± 5	-
1	± 10	± 20	± 20	± 5
0,250	± 10	± 20	± 25	± 25
0,063	± 2	± 3	± 5	± 5

[a] Not withstanding the tolerances listed above, the aggregate shall conform to the requirements of Table 1 and Table 4.

[b] For special purposes the producer and purchaser can agree reduced grading tolerances (see 5.3.4 and annex B).

5.3.3 Filler aggregate

The grading of filler aggregate determined in accordance with EN 933-10 shall conform to the limits specified in Table 3.

When required the producer shall document and declare the typical grading for each filler aggregate size produced. When assessing production within a system of continuous factory production control at least 90 % of the most recent 20 results of grading shall fall within the appropriate tolerances specified in Table 2.

Table 3 — Grading requirements for filler aggregate

Sieve size mm	Percentage passing by mass	
	Overall range for individual results	Maximum producers' declared grading range for 90 % of results
2	100	-
0,125	85 to 100	10
0,063	70 to 100	10

5.3.4 Special use aggregates

When specified for special uses and cases where the variability of grading is reduced, the grading tolerances shall be applied in accordance with annex B.

5.4 Particle shape and shell content

5.4.1 Particle shape

The particle shape of fine aggregates smaller than 4 mm is not normally relevant in the behaviour of mortars.

When required the particle shape for aggregate fractions coarser than 4 mm shall be determined in accordance with EN 933-3 and the results declared.

5.4.2 Shell content

When exceptionally required the shell content for aggregate fractions coarser than 4 mm shall be determined in accordance with EN 933-7 and the results declared.

NOTE It is usually not necessary to specify requirements for the shell content. No European test method is available for the determination of shell content in fine aggregates

5.5 Fines

5.5.1 Fines content

The fines content, determined in accordance with EN 933-1, shall not exceed the limits specified in Table 4 for the selected category. The limits for fines content of filler aggregates shall comply with the requirements specified in Table 3.

Table 4 — Limits for fines content

Aggregate size mm	**Maximum percentage passing 0,063 mm sieve by mass**				
	Category 1	Category 2	Category 3	Category 4	Category 5
0/1 [a]	3	5	8	30	>30 [a]
0/2	3	5	8	30	-
0/4; 2/4 [b]	3	5	8	30	-
0/8; 2/8 [b]	3	5	8	11	-

[a] Value to be declared by the producer.
[b] Aggregate sizes 2/4 and 2/8 are used only in mortar in combination with sizes 0/1; 0/2; 0/4 and 0/8. Combinations of aggregate sizes shall conform to the limits for the fines content for the appropriate combined aggregate size.

NOTE 1 Depending on the end use the appropriate category should be selected.

NOTE 2 Examples of end uses for different categories are:

— Category 1: Floor screeds, sprayed, repair mortars, grouts (all aggregates).
— Category 2: Rendering and plastering mortars (all aggregates).
— Category 3: Masonry mortars (all aggregates except crushed rock).
— Category 4: Masonry mortars (crushed rock).

5.5.2 Fines quality

When the fines content in the fine aggregate exceeds 3 % by mass and there is documented evidence of satisfactory use further testing may not be necessary. When it is required, aggregates and filler aggregates shall be assessed for harmful fines in accordance with annex C.

NOTE It is not possible currently, pending further research, to establish universal requirements for harmful fines for all materials. Further guidance on the assessment of harmful fines is included in annex C.

6 Physical requirements

6.1 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 in clause 6 shall be carried out to determine appropriate physical properties.

6.2 Particle density and water absorption

6.2.1 Particle density

The particle density shall be determined in accordance with EN 1097-6 and the results declared stating the clause number of the test method and the equations used.

6.2.2 Water absorption

The water absorption shall be determined in accordance with EN 1097-6 and the results declared stating the clause number of the test method and the equations used.

6.2.3 Resistance to freezing and thawing

When required the resistance to freezing and thawing of aggregate fractions coarser than 4 mm shall be determined in accordance with either EN 1367-1 or derived from the 10 mm to 14 mm aggregate fraction from the same source in accordance with EN 1367-2, and the results declared.

When the resistance to freezing and thawing of aggregates of 4 mm or less and filler aggregates is required in the end use situation, it shall be derived from a freeze-thaw test on the mortar in accordance with the provisions valid at the place of use and the results declared.

7 Chemical requirements

7.1 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 and filler aggregate. When required, the tests specified in clause 7 shall be carried out to determine appropriate chemical properties.

Aggregates and filler aggregates shall not contain materials in proportions that are harmful to the durability or surface properties of the mortar in which they are incorporated.

NOTE 1 The chemical requirements specified in 7.2, 7.3, 7.4 and 7.5 apply only to aggregates and filler aggregates for use in mortars in which the binder contains cements within the scope of EN 197-1.

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

NOTE 3 When the value of a property is required but not defined by specified limits the value should be declared by the producer as an $XX_{Declared}$ category, e.g., in Table 5 for air-cooled blast furnace slag a value of say 1,2 % corresponds to $AS_{1,2(Declared\ value)}$.

NOTE 4 When a property is not required, a “No requirement” category can be used.

NOTE 5 Guidance on selection of approriate categories for specific applications can be found in national provisions in the place of use of the aggregate and filler aggregate.