BS EN 13242:2013

Incorporating corrigendum November 2013

BSI Standards Publication

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

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 13242:2013. It supersedes BS EN 13242:2002+A1:2007 which is withdrawn.

The CEN correction notice 2 October 2013 provided a revised English language text, incorporating the following editorial corrections:

1) Scope, 1st, 2nd, 5th, and 7th paragraphs and note 2;
2) Clause 3, definitions 3.11, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18 and 3.19;
3) 4.2, 2nd paragraph;
4) 4.3.1, Table 2;
5) 4.3.2, 2nd paragraph;
6) 4.3.4, Table 4;
7) 4.5, Tables 7 and 8;
8) 4.6.1, 3rd paragraph;
9) 4.6.2, Table 11;
10) 4.6.3, 1st paragraph;
11) 5.4.1 and 5.4.2;
12) 6.4.1, 1st paragraph;
13) 6.4.2, 1st paragraph;
14) 6.5.1, 5th and 6th paragraphs, notes 3 and 4;
15) 7.3.3, 1st paragraph, last sentence;
16) Clause 10a);
17) Annex A, 2nd paragraph and Table A.1.

The UK participation in its preparation was entrusted to Technical Committee B/502, Aggregates.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2013

ISBN 978 0 580 84727 1

ICS 91.100.15

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2013.

Amendments/corrigenda issued since publication

Date	Text affected
30 November 2013	Implementation of CEN correction notice 2 October 2013

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13242

May 2013

ICS 91.100.15

English Version

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

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

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

This European Standard was approved by CEN on 4 September 2011.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13242:2013: E

Licensed copy: Lee Shau Kee Library, HKUST, Version correct as of 03/01/2015, (c) The British Standards Institution 2013

Foreword

This document (EN 13242:2013) 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 2013, and conflicting national standards shall be withdrawn at the latest by February 2015.

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 13242:2002+A1:2007.

The main changes compared to the previous edition are:

- Harmonization of Tables, Notes, comments, etc., between this standard and the other aggregate standards;

- Reference to EN 16236 which leads to a simplification of Clause 8;

- New normative requirements on fines quality (4.5);

- New normative requirement on angularity (4.6.3);

- New normative requirement on water suction height (5.6);

- New list of source materials that are within the scope of this standard (Annex A).

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.

Requirements for other end uses of 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 13055, *Lightweight aggregates;*

— EN 13139, *Aggregates for mortar;*

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

— EN 13450, *Aggregates for railway ballast.*

Requirements for evaluation of conformity are specified in EN 16236.

According to the CEN/CENELEC Internal Regulations, the national standards organisations 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.

Contents

page

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 hydraulically bound and unbound materials for civil engineering works. It also covers recycled aggregates with particle densities between 1,50 Mg/m^3 (1 500 kg/m^3) and 2,00 Mg/m^3 (2 000 kg/m^3).

A list of the source materials that have been considered and indicating those which are within the scope of this standard is given in Annex A (normative).

Requirements for the evaluation of conformity of the products to this European Standard are given in EN 16236.

This European Standard does not cover the grading properties of unbound mixtures as specified in EN 13285.

It incorporates a general requirement that aggregates will not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination.

The tables in this standard include categories which are common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242. Not all of these categories are appropriate for aggregates for use in hydraulically bound and unbound materials for civil engineering works and road constructions. Categories, notes, comments etc, which are shown grey shaded should not be used for aggregates for use in hydraulically bound and unbound materials for civil engineering works and road constructions.

Aggregates used in hydraulically bound and unbound materials for civil engineering works should comply with all the requirements of this European Standard. The standard includes comprehensive and specific requirements for natural aggregates, iron and steel making slag and recycled aggregates, dealing with, for example, the stability of certain basalts, the expansion of certain slags and the constitution of recycled aggregates.

For materials from some other secondary sources, however, work is ongoing and the requirements are incomplete. In the meantime, such materials, when placed on the market as aggregates, should conform fully to this standard but may also be required to conform to specific relevant additional requirements at the place of 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.

NOTE Requirements for lightweight aggregates are specified in prEN 13055.

Requirements for the declaration of the potential of aggregates to release regulated dangerous substances are currently under development. Until such time as these are finalised, attention should be paid to requirements at the place of 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 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 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 aggregate particles*

EN 933-6, *Tests for geometrical properties of aggregates — Part 6: Assessment of surface characteristics — Flow coefficient of 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 filler aggregates (air jet sieving)*

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

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

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

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

EN 1367-6, *Tests for thermal and weathering properties of aggregates — Part 6: Determination of resistance to freezing and thawing in the presence of salt (NaCl)*

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

EN 1744-6, *Tests for chemical properties of aggregates — Part 6: Determination of the influence of recycled aggregate extract on the initial setting time of cement*

EN 16236:2013, *Evaluation of conformity of aggregates — Initial Type Testing and Factory Production Control*

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 document, the following terms and definitions apply.

3.1
aggregate
granular material of natural, manufactured or recycled origin used in construction

3.2
natural aggregate
aggregate from mineral sources that 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 or mineral material previously used in construction

3.5
category
level of a property of an aggregate expressed as a range of values or a limiting value

Note 1 to entry: There is no relationship between the categories of different properties.

3.6
aggregate size
designation of aggregate in terms of lower (d) and upper (D) sieve sizes expressed as d/D

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

3.7
grading
particle size distribution expressed as the percentages by mass passing a specified set of sieves

Note 1 to entry: In this standard grading categories are used and expressed as GnX/Y in which:

n: type of grading
where: C = coarse;
CA = coarse for asphalt only;
G = Grit ($D \leq 4$ and $d \geq 1$);
F = fine;
NG = natural graded;
A = all-in
X: lower limit passing D

Y: upper limit passing d

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

3.9
coarse aggregate
designation given to the larger aggregate sizes with D greater than 4 mm and d greater than or equal to 1 mm

Note 1 to entry: Aggregates that do not fit the definitions for fine or coarse (like 1/3, 1/4 or 2/4) are treated as coarse aggregate.

3.10
fine aggregate
designation given to the smaller aggregate sizes with D less than or equal to 4 mm and $d = 0$

Note 1 to entry: Fine aggregates can be produced from natural disintegration of rock or gravel and/or by the crushing of rock or gravel or processing of manufactured aggregates.

3.11
all-in aggregate
aggregate consisting of a mixture of coarse and fine aggregates with D greater than 4 mm and $d = 0$

Note 1 to entry: It can be produced without separating into coarse and fine fractions or it can be produced by combining coarse and fine aggregates.

3.12
filler aggregate
aggregate, most of which passes a 0,063 mm sieve, which can be added to construction materials to provide certain properties

3.13
added filler
filler aggregate of mineral origin, which has been produced separately

4 Geometrical 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 in Clause 4 shall be carried out to determine appropriate geometrical properties.

When the value of a property is required but not defined by specified limits the value should be declared as an XX_{Declared} category, e.g., a value of say 55 for the flakiness index corresponds to FI_{55} (Declared value).

NOTE 1 When a property is not required, a “No requirement” category can be used.

NOTE 2 Guidance on selection of appropriate categories for specific applications can be found in national provisions in the place of use of the aggregate.

NOTE 3 Where conformity with a category is based on a value of a property being less than or equal to a given value, conformity with a more severe category (lower value) automatically confers conformity with all less severe categories (higher values). Similarly for categories based on the value of a property being greater than or equal to a given value, conformity with a more severe (higher value) automatically confers conformity with all less severe categories (lower values).

Categories, notes, comments etc, which are grey shaded, should not be used in bound and unbound materials for civil engineering works and road constructions.

4.2 Aggregate 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, except for aggregates added as fillers which shall be specified as filler aggregate.

Aggregate sizes shall be specified 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. A combination of sizes from set 1 and set 2 is not permissible.

Aggregate sizes shall have D/d not less than 1,4.

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

NOTE 2 Greater than 90 mm sieve sizes can be used for particular applications.

4.3 Grading

4.3.1 General

The grading of the aggregate, when determined in accordance with EN 933-1, shall conform to the requirements of 4.3.2 to 4.3.5 as appropriate to its aggregate size d/D.

Aggregates may comprise single sizes, all-in aggregates or combinations of two or more than two sizes.

Aggregates 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 aggregates 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 Table 2 to Table 5 for tolerances on manufacturer declared typical gradings.

Size designations and grading categories are essentially categories of convenience and different sizes and grading categories may be used by agreement between supplier and purchaser.

Where the specification requires the use of sieves which are a fraction or a multiple of the upper sieve size (e.g. $D/2$, $D/1{,}4$ or 1,4 D, 2 D) the sieve chosen shall be the next nearest from basic set plus set 1 or basic set plus set 2.

When a sieve size of the ISO 565 R20 series is closer to the calculated $d/2$, $D/1.4$, $D/2$, 1.4D or 2D size, the manufacturer may choose to use this R20 size.

Table 2 — General grading requirements

Aggregate	Size mm	Percentage passing by mass					Category G
		$2D$[a]	$1{,}4D$	D[b]	d[d]	$d/2$	
Coarse	$D > 4$ $d \geq 1$	100	100	90 to 99	0 to 10	0 to 2	G_C90/10
		100	98 to 100	90 to 99	0 to 15	0 to 5	G_C90/15
		100	98 to 100	85 to 99 [c]	0 to 15	0 to 5	G_C85/15
		100	98 to 100	85 to 99 [c]	0 to 20	0 to 5	G_C85/20
		100	98 to 100	80 to 99	0 to 20	0 to 5	G_C80/20
		100	98 to 100	85 to 99 [c]	0 to 15	0 to 2	G_{CA}85/15
	$d \geq 1$ $D \leq 4$	100	95 to 100	85 to 99	0 to 15	–	G_G85/15
		100	98 to 100	85 to 99	0 to 20	0 to 5	G_G85/20
Fine	$D \leq 4$ $d = 0$	100	95 to 100	85 to 99	–	–	G_F85
All-in	$D > 4$ $d = 0$	100	98 to 100	90 to 99	–	–	G_A90
		100	98 to 100	85 to 99	–	–	G_A85
		100	98 to 100	80 to 99	–	–	G_A80
		100	–	75 to 99	–	–	G_A75

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 If the percentage retained on D is < 1 % by mass the producer 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 2 intermediate between d and D.

c For single size coarse aggregates d/D, where $D/d < 2$, of the categories G_C85/15, G_C85/20 and G_{CA}85/15, the value of the percentage passing by mass at D may be lowered by 5 % according to the particular application or end use.

d Limits for the percentage passing d can be modified to 1 to 15 for G_c85/15 and 1 to 20 for G_c80/20 where necessary to ensure a well graded aggregate.

4.3.2 Coarse aggregates

Coarse aggregates shall conform to the general grading requirements specified in Table 2 appropriate to their size designation D/d and grading category G_CX/Y.

For graded aggregates, defined as those where $D/d \geq 2$, all gradings shall comply with the overall limits in Table 3 appropriate to their grading category.

The typical grading passing the mid size sieve shall be declared and the tolerances selected from Table 3 appropriate to the grading category shall be applied.

Table 3 — Overall limits and tolerances for coarse aggregate grading at mid-size sieves

D/d	**Mid-size sieve** mm	**Overall limits and tolerances at mid-size sieves** Percentage passing by mass		**Category** G
		Overall limits	Tolerances on manufacturer's declared typical grading	
< 4	$D/1,4$	**25 to 80**	**± 15**	$G_{25/15}$
		20 to 70	**± 15**	$G_{20/15}$
≥ 4	$D/2$	**20 to 70**	**± 17,5**	$G_{20/17,5}$
No requirement				G_{NR}

4.3.3 Fine aggregates

Fine aggregates shall conform to the general grading requirements of Table 2 appropriate to their upper sieve size D and grading category G_F85.

When required, the typical grading, in terms of the percentages passing the 4 mm, 2 mm, 1 mm, 0,250 mm and 0,063 mm sieves shall be declared.

When required, the grading of the fine aggregates shall conform to the tolerances in Table 4 applied around the declared typical grading.

4.3.4 All-in aggregates

All-in aggregates shall conform to the general grading requirements of Table 2 appropriate to their upper sieve size D and grading category G_AX/Y.

When required, the typical grading passing the mid size sieve shall be declared and the tolerances selected from Table 4 appropriate to the grading category shall be applied.

Table 4 — Tolerances on declared typical grading for fine and all-in aggregates

Sieve size mm	D	$D/2$	0,063 [a]	0,250 [b]	**Category** G_{TC}
Tolerances on percentage passing by mass	± 5	± 10	± 3	± 20	$G_{TC}10$
	± 5	± 20	± 5	± 25	$G_{TC}20$
	± 7,5	± 25	± 5	± 25	$G_{TC}25$
	No requirement				$G_{TC}NR$

[a] In all cases the upper limit determined by fines category takes preference.

[b] Requirements on 0,250 mm sieve are only for fine aggregates.

4.3.5 Special use aggregates and declared grading categories

When special aggregate gradings are required for a particular end use, or to define a specific source special grading envelopes shall be defined using the appropriate sieves from Table 1. The general principles of Clause 4 shall be applied using appropriate requirements at 2*D*, 1,4*D*, *D*, *d*, *d*/2. The grading category shall be quoted as DG_{XY} to indicate clearly that it is a declared or special use category.

This recognises that size designations and grading categories are essentially categories of convenience and different sizes and grading categories may be used by agreement between supplier and purchaser.

4.3.6 Grading for added filler

The grading shall be determined in accordance with EN 933-10 and shall conform to the values specified in Table 5.

Table 5 — Grading requirements for added filler

Sieve size mm	Percentage passing by mass	
	Overall range for individual results	Manufacturer's maximum declared grading range[a]
2	100	–
0,125	85 to 100	10
0,063	70 to 100	10

[a] Declared grading range on the basis of the last 20 values. 90 % of the results declared shall be within this range, but all the results shall be within the overall grading range.

4.4 Fines content

When required, the fines content shall be determined in accordance with EN 933-1 and the results declared in accordance with the relevant category specified in Table 6.

Table 6 — Categories for maximum values of fines content

Aggregate	0,063 mm sieve Percentage passing by mass	Category f
Coarse	≤ 0,5	$f_{0,5}$
	≤ 1	f_1
	≤ 1,5	$f_{1,5}$
	≤ 2	f_2
	≤ 4	f_4
	> 4	$f_{Declared}$
	No requirement	f_{NR}
Natural graded 0/8 mm	≤ 3	f_3
	≤ 5	f_5
	≤ 7	f_7
	≤ 10	f_{10}
	≤ 16	f_{16}
	> 16	$f_{Declared}$
	No requirement	fNR
All-in	≤ 3	f_3
	≤ 5	f_5
	≤ 7	f_7
	≤ 9	f_9
	≤ 11	f_{11}
	≤ 12	f_{12}
	≤ 15	f_{15}
	> 15	$f_{Declared}$
	No requirement	f_{NR}
Fine	≤ 3	f_3
	≤ 4	f_4
	≤ 5	f_5
	≤ 7	f_7
	≤ 10	f_{10}
	≤ 16	f_{16}
	≤ 22	f_{22}
	> 22	$f_{Declared}$
	No requirement	f_{NR}

4.5 Fines quality

When required, the fines quality of fine or all-in aggregates shall be evaluated and declared as follows:

When the fines content in the fine aggregate, or in the all-in aggregate 0/D, is not greater than 3 %, or any other value according to the provisions valid in the place of use of the aggregate, no further testing is required.

If the fines content is greater than 3 %, the fines of fine or all-in aggregate shall be considered non-harmful (e.g. swelling of clay) when one of the two following conditions apply:

a) The sand equivalent value SE of the required size fraction, when tested in accordance with EN 933-8 and declared in accordance with the relevant size fraction and category in Table 7, is higher than a specified limit.

Table 7 — Categories for minimum sand equivalent (SE) values

Sand equivalent	Category SE
≥ 65	SE_{65}
≥ 60	SE_{60}
≥ 55	SE_{55}
≥ 45	SE_{45}
≥ 40	SE_{40}
≥ 35	SE_{35}
≥ 30	SE_{30}
< 30	SE_{Declared}
No requirement	SE_{NR}

b) The methylene blue value *(MB)* on the required size fraction, when tested in accordance with EN 933-9 and declared in accordance with the relevant size fraction and category in Table 8, is lower than a specified limit.

Table 8 — Categories for maximum methylene blue *(MB)* values

Aggregate	Methylene blue values	Category MB
Fine	MB value g/kg	
	≤ 1	MB_1
	≤ 1,5	$MB_{1,5}$
	≤ 2	MB_2
	≤ 2,5	$MB_{2,5}$
	≤ 3	MB_3
	> 3	MB_{Declared}
	No requirement	MB_{NR}
All-in	$MB_{0/D} = MB \times$ passing the 2 mm sieve[a] g/kg	
	≤ 0,8	$MB_{\text{A}}0{,}8$
	≤ 1	$MB_{\text{A}}1$
	> 1	$MB_{\text{A}}\text{Declared}$
	No requirement	$MB_{\text{A}}\text{NR}$

[a] $MB_{0/D}$ is MB measured on 0/2 mm fraction and reported on 0/D mm.

The compliance requirements for the sand equivalent test and the methylene blue test should normally be expressed with a probability of 90 %.

NOTE If the fines content is greater than 3 % by mass and there is documented evidence of satisfactory use, further testing might not be necessary.

4.6 Particle shape of coarse and all-in aggregates

4.6.1 Flakiness index and shape index

When required, the shape shall be determined in accordance with EN 933-3 in terms of the flakiness index and the results declared in accordance with the relevant category specified in Table 9 according to the particular application or end use.

The flakiness index shall be the reference test for the determination of the shape.

For all-in aggregates the flakiness index shall be measured on the fraction 4/D.

Table 9 — Categories for maximum values of flakiness index

Flakiness index	Category FI
≤ 10	FI_{10}
≤ 15	FI_{15}
≤ 20	FI_{20}
≤ 25	FI_{25}
≤ 30	FI_{30}
≤ 35	FI_{35}
≤ 40	FI_{40}
≤ 50	FI_{50}
> 50	$FI_{Declared}$
No requirement	FI_{NR}

When required, the shape index shall be determined in accordance with EN 933-4 and the results declared in accordance with the relevant category specified in Table 10 according to the particular application or end use.

Table 10 — Categories for maximum values of shape index

Shape index	Category SI
≤ 15	SI_{15}
≤ 20	SI_{20}
≤ 25	SI_{25}
≤ 30	SI_{30}
≤ 35	SI_{35}
≤ 40	SI_{40}
≤ 50	SI_{50}
≤ 55	SI_{55}
> 55	$SI_{Declared}$
No requirement	SI_{NR}

4.6.2 Percentage of crushed or broken particles

When required, the percentage of crushed or broken particles including totally crushed particles and the percentage of totally rounded particles shall be determined in accordance with EN 933-5 and the results declared in accordance with the relevant category specified in Table 11.

Aggregates obtained from crushing rock shall be assumed to be category $C_{100/0}$ and do not require further testing.

Table 11 — Categories for percentage of crushed or broken particles (including percentage of totally crushed or broken particles and totally rounded particles)

Percentage of totally crushed or broken particles by mass	Percentage of totally crushed or broken and partially crushed or broken particles by mass	Percentage of totally rounded particles by mass	Category C
90 to 100	100	0	$C_{100/0}$
30 to 100	95 to 100	0 to 1	$C_{95/1}$
30 to 100	90 to 100	0 to 1	$C_{90/1}$
–	90 to 100	0 to 3	$C_{90/3}$
–	70 to 100	0 to 10	$C_{70/10}$
30 to 100	50 to 100	0 to 10	$C_{50/10}$
–	50 to 100	0 to 30	$C_{50/30}$
–	< 50	> 30	C_{Declared}
No requirement	No requirement	No requirement	C_{NR}

4.6.3 Angularity of aggregates

When required, the angularity of fine aggregates shall be determined in accordance with EN 933-6 and the results declared in accordance with the relevant category specified in Table 12.

Table 12 — Categories for angularity of fine aggregates

Flow coefficient	Category E_{cs}
≥ 38	$E_{\text{cs}}38$
≥ 35	$E_{\text{cs}}35$
≥ 30	$E_{\text{cs}}30$
< 30	$E_{\text{cs}}\text{Declared}$
No requirement	$E_{\text{cs}}\text{NR}$

5 Physical 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 physical properties.

When the value of a property is required but not defined by specified limits the value should be declared as an XX_{Declared} category, e.g. a Los Angeles coefficient of say 65 corresponds to LA_{70}.

NOTE 1 When a property is not required, a “No requirement” category can be used.

NOTE 2 Guidance on selection of appropriate categories for specific applications can be found in national provisions in the place of use of the aggregate.

NOTE 3 Where conformity with a category is based on a value of a property being less than or equal to a given value, conformity with a more severe category (lower value) automatically confers conformity with all less severe categories (higher values). Similarly for categories based on the value of a property being greater than or equal to a given value, conformity with a more severe (higher value) automatically confers conformity with all less severe categories (lower values).

Categories, notes, comments etc, which are grey shaded, should not be used in bound and unbound materials for civil engineering works and road constructions.

5.2 Resistance to fragmentation

When required, the resistance to fragmentation of coarse and all-in aggregates shall be determined in terms of the Los Angeles coefficient as specified in EN 1097-2. The Los Angeles test method shall be the reference test for the determination of resistance to fragmentation. The Los Angeles coefficient shall be declared in accordance with the relevant category specified in Table 13 according to the particular application or end use.

Table 13 — Categories for maximum values of Los Angeles coefficient

Los Angeles coefficient	Category LA
≤ 15	LA_{15}
≤ 20	LA_{20}
≤ 25	LA_{25}
≤ 30	LA_{30}
≤ 35	LA_{35}
≤ 40	LA_{40}
≤ 45	LA_{45}
≤ 50	LA_{50}
≤ 60	LA_{60}
> 60	$LA_{Declared}$
No requirement	LA_{NR}

When required, the impact value shall be determined in accordance with EN 1097-2 and the results declared in accordance with the relevant category specified in Table 14 according to the particular application or end use.

Table 14 — Categories for maximum values of resistance to impact

Impact value %	Category SZ
≤ 18	SZ_{18}
≤ 22	SZ_{22}
≤ 26	SZ_{26}
≤ 32	SZ_{32}
≤ 35	SZ_{35}
≤ 38	SZ_{38}
> 38	SZ_{Declared}
No requirement	SZ_{NR}

5.3 Resistance to wear

When required, the resistance to wear (Micro-Deval coefficient - M_{DE}) shall be determined in accordance with EN 1097-1 and the results declared in accordance with the relevant category specified in Table 15 according to the particular application or end use.

Table 15 — Categories for maximum values of resistance to wear

Micro-Deval coefficient	Category M_{DE}
≤ 10	$M_{\text{DE}}10$
≤ 15	$M_{\text{DE}}15$
≤ 20	$M_{\text{DE}}20$
≤ 25	$M_{\text{DE}}25$
≤ 30	$M_{\text{DE}}30$
≤ 35	$M_{\text{DE}}35$
≤ 40	$M_{\text{DE}}40$
≤ 45	$M_{\text{DE}}45$
≤ 50	$M_{\text{DE}}50$
> 50	M_{DE}Declared
No requirement	M_{DE}NR

When required, the minimum Micro-Deval coefficient shall be declared in accordance with the relevant category specified in Table 16.

Table 16 - Categories for minimum values of micro-Deval coefficient

Micro-Deval coefficient	Category $M_{DE(min)}$
≥7	$M_{DE(min)}7$
≥10	$M_{DE(min)}10$
≥15	$M_{DE(min)}15$
NR	$M_{DE(min)}NR$

5.4 Particle density and water absorption

5.4.1 Particle density

When required, the particle density shall be determined in accordance with EN 1097-6 (apparent particle density) and the results declared.

5.4.2 Water absorption

When required, the water absorption shall be determined in accordance with EN 1097-6 depending upon the size of the aggregate and the results declared.

5.5 Bulk density

When required, the bulk density shall be determined in accordance with EN 1097-3 and the results declared.

5.6 Water suction height

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

6 Chemical 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 chemical properties.

When the value of a property is required but not defined by specified limits the value should be declared as an $XX_{Declared}$ category, e.g. a value of say 1,2 % by mass for the acid-soluble sulfate content of air-cooled blast furnace slag corresponds to $AS_{1,2}$ (Declared category).

NOTE 1 When a property is not required, a “No requirement” category can be used.

NOTE 2 Guidance on selection of appropriate categories for specific applications can be found in national provisions in the place of use of the aggregate.

NOTE 3 Where conformity with a category is based on a value of a property being less than or equal to a given value, conformity with a more severe category (lower value) automatically confers conformity with all less severe categories (higher values). Similarly for categories based on the value of a property being greater than or equal to a given value,

conformity with a more severe (higher value) automatically confers conformity with all less severe categories (lower values).

Categories, notes, comments etc, which are grey shaded, should not be used in bound and unbound materials for civil engineering works and road constructions.

6.2 Petrographic description

When required, the petrographic description of the aggregate shall be determined and described in accordance with EN 932-3 and the results declared.

6.3 Classification of the constituents of coarse and all-in recycled aggregates

For recycled aggregates, the proportions of constituent materials in coarse and all-in recycled aggregates shall be determined in accordance with EN 933-11. For all-in aggregates, the coarse aggregate fraction shall be tested. The results shall be declared in accordance with the relevant categories specified in Table 17.

Table 17 — Categories for constituents of coarse recycled aggregates

Constituent	Content Percentage by mass	Category
Rc	≥ 90	Rc_{90}
	≥ 80	Rc_{80}
	≥ 70	Rc_{70}
	≥ 50	Rc_{50}
	< 50	$Rc_{Declared}$
	No requirement	Rc_{NR}
Ru	≥ 90	Ru_{90}
	≥ 70	Ru_{70}
	≥ 50	Ru_{50}
	< 50	$Ru_{Declared}$
	No requirement	Ru_{NR}
$Rc + Ru$	≥ 95	Rcu_{95}
	≥ 90	Rcu_{90}
	≥ 70	Rcu_{70}
	≥ 50	Rcu_{50}
	< 50	$Rcu_{Declared}$

Table 17 (*continued*)

	No requirement	Rcu_{NR}
$Rc + R\,u + Rg$	≥ 90	$Rcug_{90}$
	≥ 70	$Rcug_{70}$
	≥ 50	$Rcug_{80}$
	< 50	$Rcug_{Declared}$
	No requirement	$Rcug_{NR}$
Rb	≤ 10	Rb_{10-}
	≤ 30	Rb_{30-}
	≤ 50	Rb_{50-}
	> 50	$Rb_{Declared}$
	No requirement	Rb_{NR}
Ra	≥ 95	Ra_{95}
	≥ 80	Ra_{80}
	≥ 50	Ra_{50}
	≥ 40	Ra_{40}
	> 30	Ra_{30}
	≤ 30	Ra_{30-}
	≤ 20	Ra_{20-}
	≤ 10	Ra_{10-}
	≤ 5	Ra_{5-}
	≤ 1	Ra_{1-}
	No requirement	Ra_{NR}
Rg	≤ 2	Rg_{2-}
	≤ 5	Rg_{5-}
	≤ 25	Rg_{25-}
	No requirement	Rg_{NR}
X	≤ 1	X_{1-}
$X + Rg$	≤ 0,5	$XRg_{0,5-}$
	≤ 1	XRg_{1-}
	≤ 2	XRg_{2-}
	No Requirement	XRg_{NR}
	Content	**Category**
	cm^3/kg	
FL	≤ 0,2	$FL_{0,2-}$
	≤ 2	FL_{2-}
	≤ 5	FL_{5-}
	≤ 10	FL_{10-}
	No Requirement	FL_{NR-}

where, according to EN 933-11:

Constituent	Description
Rc	Concrete, concrete products, mortar Concrete masonry units
Ru	Unbound aggregate, natural stone Hydraulically bound aggregate
Rb	Clay masonry units (i.e. bricks and tiles) Calcium silicate masonry units Aerated non-floating concrete
Ra	Bituminous materials
FL	Floating material in volume
X	Other: Cohesive (i.e. clay and soil) Miscellaneous: metals (ferrous and non-ferrous), non-floating wood, plastic and rubber Gypsum plaster
Rg	Glass

6.4 Sulfur containing compounds

6.4.1 Acid-soluble sulfate

When required, the acid soluble sulfate content of aggregates for hydraulically bound materials, determined in accordance with EN 1744-1, shall be declared in accordance with the relevant category specified in Table 18.

Table 18 — Categories for maximum values of acid-soluble sulfate content

Aggregate	Acid soluble sulfate content Percentage by mass	Category *AS*
Aggregates other than air-cooled blast furnace slag	≤ 0,2	$AS_{0,2}$
	≤ 0,8	$AS_{0,8}$
	> 0,8	$AS_{Declared}$
	No requirement	AS_{NR}
Air-cooled blast furnace slag	≤ 1,0	$AS_{1,0}$
	> 1,0	$AS_{Declared}$
	No requirement	AS_{NR}

6.4.2 Total sulfur

When required, the total sulfur content, determined in accordance with EN 1744-1, shall be declared in accordance with the relevant category specified in Table 19.

Table 19 — Categories for maximum values of total sulfur content

Aggregate	Total sulfur content %	Category *S*
Aggregates other than air-cooled blast furnace slag	≤ 1	S_1
	> 1	$S_{Declared}$
	No requirement	S_{NR}
Air-cooled blast furnace slag	≤ 2	S_2
	> 2	$S_{Declared}$
	No requirement	S_{NR}

Special precautions are necessary if pyrrhotite, an unstable form of iron sulfide (FeS), is present in the aggregate. If this mineral is known to be present, a maximum total sulfur content of 0,4 % as S shall apply.

6.4.3 Water-soluble sulfate content of recycled aggregates

When required, the water-soluble sulfate content of recycled aggregates, determined in accordance with EN 1744-1, shall be declared in accordance with the relevant category specified in Table 20.

Table 20— Categories for the maximum values of water-soluble sulfate content of recycled aggregates

Water-soluble sulfate content Percentage by mass	Category SS
≤ 0,2	$SS_{0,2}$
≤ 0,7	$SS_{0,7}$
≤ 1.3	$SS_{1.3}$
No requirement	SS_{NR}

NOTE Water-soluble sulfates determined according to EN 1744-1, are essentially potentially active sulfates (e.g. gypsum plaster) sources of destruction of civil engineering works and roads.

6.5 Other constituents

6.5.1 Constituents which alter the rate of setting and hardening of hydraulically bound mixtures

The presence of organic matter shall be determined in accordance with EN 1744-1 (presence of humus test). If the results indicate the presence of high humic acid, the presence of fulvo acids shall be determined in accordance with EN 1744-1. If the supernatant liquid in these tests is lighter than the standard colours the aggregates shall be considered to be free from organic matter.

NOTE 1 Some inorganic compounds which discolour the supernatant liquid in the sodium hydroxide test do not adversely affect the setting and hardening of hydraulically bound mixtures.

Sugars do not affect the colour of the supernatant liquid in the humus content test or the fulvo acid test. If it is suspected that sugars or sugar type materials are present, the aggregate should be tested using the mortar

specimen test (see EN 1744-1). The stiffening time and compressive strength requirements shown below should apply.

Aggregates that contain organic or other substances in proportions that alter the rate of setting and hardening of hydraulically bound mixtures shall be assessed for the effect on stiffening time and compressive strength in accordance with EN 1744-1.

The proportions of such materials shall be such that they do not:

a) increase the stiffening time of mortar test specimens by more than 120 min;

b) decrease the compressive strength of mortar test specimens by more than 20 % at 28 days.

When required, recycled aggregates shall be assessed for the influence of water-soluble materials from the aggregates on the initial setting time of cement paste in accordance with EN 1744-6. The change in initial setting time, A t_e, shall conform to the requirements of Table 21.

Table 21 — Categories for influence of water-soluble materials from recycled aggregates on the initial setting time of cement paste

Change in initial setting time, A t_e min	Category A
≤ 10	*A*10
≤ 40	*A*40
> 40	$A_{Declared}$
No requirement	A_{NR}

NOTE 2 Sugars do not affect the colour of the supernatant liquid in the sodium hydroxide or the fulvo acid test. If it is suspected that sugars or sugar type materials are present, the aggregate should be tested using the water extract test (see EN 1744-6). The requirements for the influence on setting time shown above should apply.

NOTE 3 Constituents of recycled aggregates that may adversely affect the rate of setting and hardening of hydraulically bound mixtures may be inorganic, and therefore not detected by the procedures given in EN 1744-1. The procedures given in EN 1744-6 should be used for recycled aggregates.

6.5.2 Constituents which affect the volume stability of blast furnace and steel slag for unbound aggregates

6.5.2.1 Dicalcium silicate disintegration of air-cooled blast furnace slag

When required, air-cooled blast furnace slag determined in accordance with EN 1744-1 shall be free from dicalcium silicate disintegration and the results declared.

6.5.2.2 Iron disintegration of air-cooled blast furnace slag

When required, air-cooled blast furnace slag determined in accordance with EN 1744-1 shall be free from iron disintegration and the results declared.

6.5.2.3 Volume stability of steel slag

When required, the volume stability of steel slag shall be determined in accordance with EN 1744-1. Steel slag shall be considered to be volumetrically stable if the expansion is not greater than the specified maximum value declared in accordance with the category specified in Table 22 according to the particular application or

end use. For determination of the magnesium oxide (MgO) content the relevant test specified in EN 196-2 shall be used and the results declared.

Table 22 — Categories for maximum expansion values for steel slag

Type of steel slag	Expansion[c,d] Percentage by volume	Category V
BOF-slag[a]/EAF-slag[b]	≤ 3,5	$V_{3,5}$
	≤ 5	V_{5}
	≤ 6,5	$V_{6,5}$
	≤ 7,5	$V_{7,5}$
	≤ 10	V_{10}
	> 10	$V_{Declared}$
	No requirement	V_{NR}

[a] Basic oxygen furnace slag.

[b] Electric arc furnace slag.

[c] When the MgO content determined in accordance with EN 196-2 is not greater than or equal to 5 %, the testing time should be 24h. When the MgO content is more than 5 %, the testing time should be 168h.

[d] The total MgO content is used as a measure of free MgO, in the absence, at present of a reliable method of determining the content of free MgO. In the event of a reliable method being developed, the types should be redefined in terms of free MgO content. MgO values declared by steel manufacturers are acceptable for use in determining testing time for steel slag.

7 Durability

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. When required, the tests specified in Clause 7 shall be carried out to determine appropriate properties for the durability of aggregates.

NOTE Where conformity with a category is based on a value of a property being less than or equal to a given value, conformity with a more severe category (lower value) automatically confers conformity with all less severe categories (higher values). Similarly for categories based on the value of a property being greater than or equal to a given value, conformity with a more severe (higher value) automatically confers conformity with all less severe categories (lower values).

The tables in this standard include categories which are common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242.

Categories, notes, comments etc, which are grey shaded, should not be used in in bound and unbound materials for civil engineering works and road constructions.

7.2 Magnesium sulfate soundness of coarse aggregates

When required, the resistance to weathering of coarse aggregates shall be determined in accordance with the magnesium sulfate soundness test in EN 1367-2 and the results declared in accordance with the relevant category specified in Table 23.

Table 23 — Categories for maximum magnesium sulfate soundness

Magnesium sulfate value Percentage loss of mass	**Category** MS
≤ 18	MS_{18}
≤ 25	MS_{25}
≤ 35	MS_{35}
> 35	$MS_{Declared}$
No requirement	MS_{NR}
NOTE The test to determine the magnesium sulfate values does not apply to recycled aggregates with cementitious fractions.	

7.3 Freeze-thaw resistance

7.3.1 Water absorption as a screening test for freeze-thaw resistance

When required, the water absorption value as a screening test shall be determined in accordance with the procedures specified in EN 1097-6 and the result declared.

If the water absorption, determined in accordance with EN 1097-6 (water absorption 24 h) for the relevant test fraction, is not greater than the value selected as one of the categories specified in Table 24, the aggregate shall be assumed to be freeze-thaw resistant.

NOTE With some aggregates sources containing a proportion of microporous flint aggregates the differentiation between satisfactory and unsatisfactory freeze-thaw durability can be better assessed by density measurements rather than water absorption.

Table 24 — Categories for maximum values of water absorption (EN 1097-6 water absorption 24 h)

Water absorption Percentage by mass	**Category** WA_{24}
≤ 1	$WA_{24}1$
≤ 2	$WA_{24}2$
NOTE The water absorption test is not applicable for blast furnace slag and unaltered porous basalt.	

7.3.2 Resistance to freezing and thawing

When required, the resistance to freezing and thawing shall be determined in accordance with EN 1367-1 and the results declared in accordance with the relevant category specified in Table 25.

Table 25 — Categories for maximum freeze-thaw resistance values

Freeze-thaw Percentage loss of mass	**Category** F
≤ 1	F_1
≤ 2	F_2
≤ 4	F_4
> 4	F_{Declared}
No requirement	F_{NR}

7.3.3 Resistance to freezing and thawing in the presence of salt (extreme conditions)

When required (see note below), the resistance to freezing and thawing in the presence of salt shall be determined in accordance with EN 1367-6 and the results declared in accordance with the relevant category specified in Table 26. In this case the resistance to freezing and thawing (see 7.3.3) shall not be determined.

NOTE The results of this test provide a means for assessing an aggregate's resistance to frost weathering in areas where frequent freeze-thaw cycling occurs with seawater sprays or abundant de-icers conditions, and where result values of EN 1367-1 test method do not describe correctly aggregate performance in extreme conditions.

This test has been found to be appropriate for certain petrographic types of aggregate (e.g. basalts) under severe conditions of use and may not be universally applicable to all rock types.

Table 26 — Categories for maximum freeze-thaw resistance in the presence of salt

Freeze-thaw Percentage loss of mass	**Category** F_{EC}
≤ 2	$F_{\text{EC}}2$
≤ 4	$F_{\text{EC}}4$
≤ 5	$F_{\text{EC}}5$
≤ 6	$F_{\text{EC}}6$
≤ 8	$F_{\text{EC}}8$
≤ 14	$F_{\text{EC}}14$
≤ 25	$F_{\text{EC}}25$
≤ 50	$F_{\text{EC}}50$
> 50	$F_{\text{EC-Declared}}$
No requirement	$F_{\text{EC-NR}}$
NOTE When tests using de-icing solutions other than NaCl, the limits of Table 26 would not apply.	

7.4 "Sonnenbrand" of basalt

Where signs of "Sonnenbrand" are known the loss of mass and the resistance to fragmentation shall be determined in accordance with EN 1367-3 and EN 1097-2.

NOTE "Sonnenbrand" is a type of rock decay that can be present in some basalts and manifests itself under the influence of atmospheric conditions. It starts with the appearance of grey/white coloured spots. Usually hairline cracks are generated radiating out from the spots and interconnecting them. This reduces the strength of the mineral fabric, and as a result the rock decays to small particles. Depending on the source, this process can take place within months of extraction or extend over several decades. In exceptional cases a rapid decay results in the formation of large cracks and the breaking of aggregate particles.

On completion of the boiling test, the loss of mass and the resistance to fragmentation (SB_{SZ} or SB_{LA}) shall be declared in accordance with the relevant category specified in Table 27 according to the particular application or end use.

Table 27 — Categories for maximum values of resistance to "Sonnenbrand"

Test method	Result	Value	Category SB
Boiling test and	Loss of mass after boiling	≤ 1	
a) Impact test	Increase of impact value after boiling	≤ 5	SB_{SZ}
or			
b) Los Angeles test	Increase of Los Angeles coefficient after boiling	≤ 8	SB_{LA}
Boiling test and	Loss of mass after boiling	> 1	
a) Impact test	Increase of impact value after boiling	> 5	$SB_{SZ\ Declared}$
or			
b) Los Angeles test	Increase of Los Angeles coefficient after boiling	> 8	$SB_{LA\ Declared}$
No requirement			SB_{NR}

8 Evaluation of conformity

The conformity of the product with the requirements of this standard shall be demonstrated by initial type testing and factory production control by the manufacturer in accordance with EN 16236.

9 Designation

9.1 Designation and description

Aggregates shall be identified in the following terms:

a) source and manufacturer — if the material has been re-handled in a depot both source and depot shall be given;

b) type of aggregate (see Annex A);

c) for recycled aggregates, the constituent categorisation according to Table 17;

d) aggregate size.

9.2 Additional information for the description of an aggregate

The necessity for other information depends on the situation and end use, for example:

a) a code to relate the designation to the description;

b) any other additional information needed to identify the particular aggregate.

The purchaser should inform the manufacturer at the time of order of any special requirements associated with a particular end use and of requirements for extra information not covered in Table ZA.1.

10 Marking and labelling

The delivery ticket shall contain at least the following information:

a) designation;

b) date of dispatch;

c) serial number of the ticket;

d) reference to this European Standard.

NOTE For CE marking and labelling see ZA.3 for additional information required to be included on the delivery ticket.

Annex A
(normative)

Source materials considered in the development of EN 13242 and their status in respect of the scope of this standard

The source types listed in this annex have been considered in the preparation of this standard. Their status within the standard is indicated in Table A.1. Source materials not described here are outside the scope of EN 13242.

Sources with no history of use in hydraulically bound and unbound materials are outside the scope of the standard and cannot be used as aggregate in conformity with this standard, and are therefore shown grey shaded in Table A.1.

Sources with positive history of use and no identification of the need for additional requirements are fully within the scope of the standard.

Sources with a positive history of use and where the need for additional requirements has been identified are provisionally within scope pending the inclusion of suitable test methods and requirements.

In all cases there is an obligation to control the potential release of regulated dangerous substances (RDS) in accordance with Member State requirements at the place of use.

The information in this annex is based on a comprehensive survey of the use of aggregates from secondary sources in European member states undertaken between 2000 and 2005. CEN/TC 154 intends to keep this inventory under continual review. Any relevant information to assist in the updating of this annex including any proposal for the inclusion of new source types should be submitted to the secretariat of CEN/TC 154.

In situations where the need for additional requirements has been identified, such materials, when placed on the market as aggregates, will comply fully with this standard but may also be required to comply with specific relevant additional requirements at the place of 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.

Under an extension to its Mandate, CEN/TC 154 is currently developing requirements for the declaration of the potential of aggregates to release regulated dangerous substances under Essential Requirement 3. It is anticipated that the source classifications in this annex will be used as the basis of families for the collation of data and the development of source specific requirements for regulated dangerous substances. Any input to this process should be made through the secretariat of CEN/TC 154.

Table A.1 — Inventory list with classification codes and status for source materials for EN 13242 aggregates

Nr.	Source	Subnr.	Specific material	History of use	Special requirements in standard	Additional requirements identified for inclusion
P	Natural aggregates	P	All petrographic types included in EN 932-3	Yes	Yes	No
A	Construction and demolition recycling industries	A1	Reclaimed asphalt	Yes	Yes	No
		A2	Crushed concrete	Yes	Yes	No
		A3	Crushed bricks, masonry	Yes	Yes	No
		A4	Mix of A1, A2 and A3	Yes	Yes	No
B	Municipal solid waste incineration industry	B1	Municipal incinerator bottom ash[a] (excluding fly ash) (MIBA)	Yes	No	Yes
		B2	Municipal incinerator fly ash (MIFA)	No	-	-
C	Coal Power generation industry	C1	Coal fly ash	Yes	No	Yes
		C2	Fluidized bed combustion fly ash (FBCFA)	Yes	No	No
		C3	Boiler slag	Yes	No	Yes
		C4	Coal bottom ash	Yes	No	Yes
		C5	Fluidized bed combustion bottom ash (FBC bottom ash)	Yes	No	No
D	Iron and steel industry	D1	Granulated blast furnace slag (GBS) (vitrified)	Yes	Yes	No
		D2	Air-cooled blast furnace slag (ABS) (crystallized)	Yes	Yes	No
		D3	Basic oxygene furnace slag (converter slag, BOS)	Yes	Yes	No
		D4	Electric arc furnace slag (from carbon steel production, EAF C)	Yes	Yes	No
		D5	Electric arc furnace slag (from stainless/high alloy steel production, EAF S)	No	-	-
E	Non ferrous steel industry	E1	Copper slag	Yes	No	No
		E2	Molybdenum slag	No	-	-
		E3	Zinc slag	Yes	No	No
		E4	Phosphorous slag	Yes	No	No
F	Foundry industry	F1	Foundry sand	Yes	No	No
		F2	Foundry cupola furnace slag	Yes	No	Yes

Table A.1 (*continued*)

Nr.	Source	Subnr.	Specific material	History of use	Special requirements in standard	Additional requirements identified for inclusion
G	Mining and quarry industry	G1	Red coal shale	Yes	No	No
		G2	Refuse from hard coal mining (black coal shale)	Yes	No	Yes
		G3	Pre-selected all-in from quarry/mining	Yes	No	No
		G4	Spent oil shale	Yes	No	No
H	Maintenance dredging works	H1	Dredge spoil sand	Yes	No	No
		H2	Dredge spoil clay	No	-	-
I	Miscellaneous	I1	Excavated soil	No	-	-
		I2	Paper sludge ash	Yes	No	Yes
		I3	Sewage sludge incineration ash (municipal)	Yes	No	Yes
		I4	Biomass ash	Yes	No	Yes
		I5	Crushed glass	Yes	Yes	No
		I6	Expanded clay–	See EN 13055		

[a] Requirements on MSWI bottom ash are based on experience with grated installations

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/125 “Aggregates”, given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the aggregates and fillers covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

WARNING — Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the aggregates and fillers falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://ec.europa.eu/enterprise/construction/cpd-ds).

This annex has the same scope as Clause 1 of this standard with regard to the products covered. It establishes the conditions for the CE marking of aggregates and fillers intended for the use indicated below and shows the relevant clauses applicable (see Table ZA.1).

Table ZA.1 — Scope, characteristics meeting Mandate M/125 and relevant clauses

Construction product:	Aggregates obtained by processing natural or manufactured or recycled materials as covered by the scope of this standard
Intended use(s):	Hydraulically bound and unbound materials for use in civil engineering and road construction

Essential characteristics	Requirement clauses in this and/or another standard(s)	Levels and/or classes	Notes
Particle shape, size and density	4.2 Aggregate sizes	None	Designation (d/D)
	4.3 Grading	None	Tolerance Category
	4.6.1 Flakiness index and shape index	None	Category
	4.6.3 Angularity of fine aggregates	None	Category
	5.4.1 Particle density	None	Declared value
Cleanliness	4.4 Fines content	None	Category
	4.5 Fines quality	None	Category
Percentage of crushed and broken surfaces	4.6.2. Percentage of crushed or broken particles	None	Category
Resistance to fragmentation/crushing	5.2 Resistance to fragmentation	None	Category
Volume stability	6.5.2.1 Dicalcium silicate disintegration of air cooled blast-furnace slag	None	Pass/fail
	6.5.2.2 Iron disintegration of air cooled blast-furnace slag	None	Pass/fail
	6.5.2.3 Volume stability of steel slag aggregates	None	Category
Water absorption/suction	5.4.2 Water absorption	None	Declared value
	5.6 Water suction height	None	Declared value
Composition/content	6.2 Petrographic description	None	Declared values
	6.3 Classification of the constituents of coarse recycled aggregates	None	Category
	6.4.3 Water-soluble sulfate content of recycled aggregates	None	Category
	6.4.1 Acid soluble sulfate	None	Category
	6.4.2 Total sulfur	None	Category
	6.5.1 Constituents which alter the rate of setting and hardening of hydraulically bound mixtures	None	Pass/fail Category
Resistance to attrition	5.3 Resistance to wear	None	Category

Table ZA.1 (*continued*)

Dangerous substances: Emission of radioactivity Release of heavy metals Release of polyaromatic carbons Release of other dangerous substances	 NOTE in ZA.1 above EN 16236:2013, 5.3.4 Knowledge of the raw material EN 16236:2013, 5.3.5 Management of the production	 None None None	
Durability against weathering	7.2 Magnesium sulfate soundness of coarse aggregates 7.4 "Sonnenbrand" of basalt	None None	Category Category
Durability Freezing and thawing	7.3.1 Water absorption as a screening test for freeze-thaw resistance	None	Category
	7.3.2 Resistance to freezing and thawing	None	Category
	7.3.3 Resistance to freezing and thawing in the presence of salt (extreme conditions)	None	Category

The requirement on a certain characteristic is not applicable in those Member States where there are no regulatory requirements on that characteristic for the intended end use of the product. In this case, manufacturers placing their products on the market of these Member States are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold value.

ZA.2 Procedures for attestation of conformity of aggregates and fillers

ZA.2.1 Systems of attestation of conformity

The systems of attestation of conformity for the aggregates indicated in Table ZA.1, in accordance with the decision of the Commission 98/598/EC of 9 October 1998 amended by 2002/592/EC of 15 July 2002 (Official Journal L192) and as given in annex 3 of the mandate M/125 “Aggregates”, as amended, is shown in Tables ZA.2a and ZA.2b for the indicated intended use(s):

Table ZA.2a — Systems of attestation of conformity for aggregates for uses with high safety requirements[1)] (where third party intervention is required)

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Aggregates for unbound and hydraulically bound mixtures	For roads and other civil engineering works	–	2+
System 2+: See Directive 89/106/EEC (CPD) annex III.2.(ii), First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control			

Table ZA.2b — Systems of attestation of conformity for aggregates for uses without high safety requirements[1)] where no third party intervention is required

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Aggregates for unbound and hydraulically bound mixtures	For roads and other civil engineering works	–	4
System 4: See Directive 89/106/EEC (CPD) annex III.2.(ii), Third possibility			

The attestation of conformity of the aggregates in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3a and Table ZA.3b resulting from application of the clauses of this European Standard indicated therein.

1) Safety requirements are to be defined by Member States in their national laws, regulations and administrative provisions.

Table ZA.3a — Assignation of evaluation of conformity tasks (for aggregates under system 2+)

Tasks			Coverage of the task	Evaluation of conformity clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (F.P.C)		Parameters related to all relevant characteristics of Table ZA.1	Clause 8 of present standard and Clause 5 of EN 16236:2013
	Initial type testing by the manufacturer		All characteristics of Table ZA.1	Clause 8 of present standard and Clause 4 of EN 16236:2013
Tasks under the responsibility of the product certification body	Certification of the conformity of the product on the basis of:	Initial inspection of factory and of F.P.C	Parameters related to all relevant characteristics of Table ZA.1	Clause 8 of present standard and Clause 5 of EN 16236:2013
		Continuous surveillance, assessment and approval of F.P.C.	Parameters related to all relevant characteristics of Table ZA.1	Clause 8 of present standard and Clause 5 of EN 16236:2013

Table ZA.3b — Assignation of evaluation of conformity tasks (for aggregates under system 4)

Tasks		Coverage of the task	Clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (F.P.C)	Parameters related to all relevant characteristics of Table ZA.1	Clauses 8 and 5 of EN 16236:2013
	Initial type testing	All relevant characteristics of Table ZA.1	Clauses 8 and 4 of EN 16236:2013

ZA.2.2 EC Certificate Declaration of conformity

ZA.2.2.1 In case of products following Table ZA.3a

When compliance with the conditions of this annex is achieved, and once the notified body shall has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall draw up and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

— provisions to which the product conforms (Annex ZA of this EN)), and a reference to the ITT report(s) and factory production control records (if appropriate);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);

the name and address of the notified body, where applicable;

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The declaration shall be accompanied by a factory production control certificate, drawn up by the notified body, which shall contain, in addition to the information above, the following:

— name and address of the notified body;

— the number of the factory production control certificate;

— conditions of validity of the certificate, where applicable;

— name of, and position held by, the person empowered to sign the certificate.

The above mentioned declaration shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.2.2.2 In case of products following Table ZA.3b

When compliance with this annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity (EC Declaration of conformity), which entitles the manufacturer to affix of the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use,...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

— provisions to which the product conforms (Annex ZA of this EN);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc.);

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or of his authorised representative.

The above mentioned declaration shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EEC, and shall

be shown on the accompanying label, the packaging or on the accompanying commercial technical) documentation e.g. a delivery note. The following information shall accompany the CE marking symbol:

— identification number of the certification body (only for products under system 2+);

— name or identifying mark and registered address of the manufacturer;

— the last two digits of the year in which the marking is affixed;

— the number of the EC certificate of factory production control (only for products under system 2+);

— reference to this European Standard (EN 13242), with date of version;

— description of the product: generic name, material, dimensions, … and intended use;

— information on the relevant essential characteristics in Table ZA.1 namely:

  — declared values and, where relevant, level or class/category (including “pass” for pass/fail requirements, where necessary) to declare for each essential characteristic as indicated in "Notes" in Table ZA.1a or Table ZA.1b; and

  — characteristics against which the “No performance determined” (NPD) option is relevant.

The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements.

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

Figures ZA.1 and ZA.2 give examples of the information to be given on the label, packaging and/or commercial documents.

CE

01234

Any Co Ltd, PO Box 21, B-1050

13

0123-CPD-0456

EN 13242:2013

Aggregates for hydraulically bound and unbound materials for civil engineering work and road construction

Particle shape	Category	(e.g. Fl20, Sl40, Ecs35)
Particle size	Designation	(*d*/*D*) and tolerance category (e.g. G_c 80-20)
Particle density	Declared value	(Mg/m^3)
Cleanliness		
Fines content	Category	(e.g. f_{16})
Fines quality	Category	(e.g. MB_2, SE_{55})
Percentage of crushed particles	Category	(e.g. $C_{90/3}$)
Resistance to fragmentation/crushing	Category	(e.g. LA_{50})
Volume stability	Category	(e.g. V_5)
Water absorption/suction	Declared value	(mass fraction in *%)*
Composition/content		
Classification of coarse recycled aggregate	Category	(e.g. Rc_{90}, X_{1-}, FL_{10-})
Water soluble sulfates of recycled aggregate	Category	(e.g. $SS_{0,7}$)
Acid soluble sulfates	Category	(e.g. $AS_{0,2}$)
Total sulfur	Category	(e.g. S_{NR})
Constituents which alter the rate of setting and hardening of hydraulically bound mixtures	Pass/fail Threshold Value	(*Stiffening time in min ; compressive strength S %*)
Resistance to attrition	Category	(e.g. $M_{DE}25$)
Emission of radioactivity	Declared value as requested	
Release of heavy metals **Release of polyaromatic carbon** **Release of other dangerous substances**	Threshold values valid in the place of use	
Durability against freeze-thaw	Category	(e.g. $WA_{24}2$, F_4 or MS_{25})

CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.

Identification number of the inspection body

Name or identifying mark and registered address of the manufacturer

Last two digits of the year in which the marking was affixed

Number of the EC certificate

No. of European Standard with date of version

Description of product and

information on product and on regulated characteristics

Figure ZA.1 — Example of CE marking information for aggregates under system 2+

CE

Any Co Ltd, PO Box 21, B-1050

13

EN 13242:2013

Aggregates for hydraulically bound and unbound materials for civil engineering work and road construction

Particle shape	Category	(e.g. Fl20, Sl40, Ecs35)
Particle size	Designation	(*d*/*D*) and tolerance category (e.g. G_c 80-20)
Particle density	Declared value	(Mg/m^3)
Cleanliness		
Fines content	Category	(e.g. f_{16})
Fines quality	Category	(e.g. MB_2, SE_{55})
Percentage of crushed particles	Category	(e.g. $C_{90/3}$)
Resistance to fragmentation/crushing	Category	(e.g. LA_{50})
Volume stability	Category	(e.g. V_5)
Water absorption/suction	Declared value	(mass fraction in *%)*
Composition/content		
Classification of coarse recycled aggregate	Category	(e.g. Rc_{90}, X_{1-}, FL_{10-})
Water soluble sulfates of recycled aggregate	Category	(e.g. $SS_{0,7}$)
Acid soluble sulfates	Category	(e.g. $AS_{0,2}$)
Total sulfur	Category	(e.g. S_{NR})
Constituents which alter the rate of setting and hardening of hydraulically bound mixtures	Pass/fail threshold value	(*Stiffening time in min and compressive strength S%*)
Resistance to attrition	Category	(e.g. $M_{DE}25$)
Emission of radioactivity	Declared value as requested	
Release of heavy metals	Threshold values valid in the place of use	
Release of polyaromatic carbon		
Release of other dangerous substances		
Durability against freeze-thaw	Category	(e.g. $WA_{24}2$, F_4 or MS_{25})

CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.

Name or identifying mark and registered address of the manufacturer

Last two digits of the year in which the marking was affixed

No. of European Standard with date of version

Description of product

and

information on product and on regulated characteristics

Figure ZA.2 — Example of CE marking information for aggregates under system 4

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 1 European legislation without national derogations need not be mentioned.

NOTE 2 Affixing the CE marking symbol means, if a product is subject to more than one directive, that it complies with all applicable directives.

Bibliography

[1] EN 12620, *Aggregates for concrete*

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

[3] prEN 13055, *Lightweight aggregates for concrete, mortar, grout, bituminous mixtures, surface treatments and for unbound and bound applications*

[4] EN 13139, *Aggregates for mortar*

[5] EN 13383-1, *Armourstone — Part 1: Specification*

[6] EN 13450, *Aggregates for railway ballast*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™