BS EN 13043:2013

Incorporating corrigendum November 2013

BSI Standards Publication

Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 13043:2013. It supersedes BS EN 13043:2002 which is withdrawn.

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

1) Scope, 3rd paragraph;
2) Clause 3 (definitions 3.11, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18 and 3.19);
3) 4.1, 5.1, 6.1 and 7.1, last paragraph;
4) 4.2, 2nd paragraph;
5) 4.3.1, Table 2;
6) 4.5, last paragraph;
7) 4.5, Table 7;
8) 4.6.1, 3rd paragraph;
9) 5.4.1;
10) 5.9;
11) 7.3.3, Table 24;
12) 8.1, 3rd paragraph;
13) 8.3.3.1, Table 29;
14) Clause 11a);
15) Annex A, 2nd paragraph.

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 84729 5

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 13043

May 2013

ICS 91.100.15

English Version

Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas

Granulats pour mélanges bitumineux et pour enduits superficiels utilisés dans la construction des chaussées, aérodromes et autres zones de circulation

Gesteinskörnungen für Asphalt und Oberflächenbehandlungen für Straßen, Flugplätze und andere Verkehrsflächen

This European Standard was approved by CEN on 24 August 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 13043:2013: E

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

Foreword

This European Standard (EN 13043:2013) 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 European Standard supersedes EN 13043:2002.

The main changes compared to the previous edition are:

a) Description of evaluation of conformity of aggregates - initial type testing and factory production control in a separate new standard EN 16236;

b) Implementing recycling aggregates;

c) Implementing general sentences on dangerous substances and adding a new normative Annex A dealing with all source materials considered;

d) Unification of categories which are common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242;

e) Unification of definitions which are common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242, i. e. for coarse, fine, all-in aggregates and natural graded 0/8 aggregates;

f) Adding requirements for the sand equivalent value for fines quality;

g) Implementation of new methylene blue values for fines quality;

h) Slight modifications of flakiness/shape indices and Los Angeles-, Micro Deval- and Nordic Abrasion values;

i) Reorganisation of chemical requirements;

j) Reorganisation of durability including a new requirement for the resistance to freezing and thawing in the presence of salt (extreme conditions);

k) Precision of carbonate content of filler aggregate and calcium carbonate content of limestone filler aggregate;

l) Deletion of the old Annexes A and B.

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 13055 (all parts), *Lightweight aggregates*;

— EN 13139, *Aggregates for mortar*;

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

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

— EN 13450, *Aggregates for railway ballast*.

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 bituminous mixtures and surface treatments for roads, airfields and other trafficked areas. This standard does not cover the use of reclaimed bituminous mixtures[3]. It also covers recycled aggregate with densities between 1,50 Mg/m^3 (1 500 kg/m^3) and 2,00 Mg/m^3 (2 000 kg/m^3) with appropriate caveats and recycled fine aggregate with appropriate caveats.

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.

It incorporates a general requirement that aggregates shall 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 for bituminous mixtures.

Categories, notes, comments etc., which are grey shaded, should not be used for aggregates for bituminous mixtures.

Aggregates used in construction should comply with all the requirements of the relevant European Standards. These standards include 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 1 Requirements for lightweight aggregates are specified in EN 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.

NOTE 2 Requirements for reclaimed asphalt for use as a constituent of asphalt mixtures are specified in EN 13108-8 and are not therefore covered in detail in this standard. EN 13108-8 does however call up the general requirements of EN 13043 for the aggregate component of reclaimed asphalt.

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 196-6, *Methods of testing cement — Part 6: Determination of fineness*

EN 459-2, *Building lime — Part 2: Test methods*

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

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

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

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

EN 1097-5, *Tests for mechanical and physical properties of aggregates — Part 5: Determination of the water content by drying in a ventilated oven*

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

EN 1097-7, *Tests for mechanical and physical properties of aggregates — Part 7: Determination of the particle density of filler — Pyknometer method*

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

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

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

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 1744-4, *Tests for chemical properties of aggregates — Part 4: Determination of water susceptibility of fillers for bituminous mixtures*

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

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

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

EN 13179-2, *Tests for filler aggregate used in bituminous mixtures — Part 2: Bitumen number*

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

ISO 9277, *Determination of the specific surface area of solids by gas adsorption — BET method*

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 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 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 defined below

C = coarse

CA = coarse for asphalt only

G = Grit (D ≤ 4 and d ≥ 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 aggregate can be produced from natural disintegration of rock or gravel and/or by the crushing of rock or gravel or processing of manufactured aggregates.

3.11
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, that can be added to construction materials to provide certain properties

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

3.14
mixed filler
filler aggregate of mineral origin, which has been mixed with calcium hydroxide

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 aggregates shall be tested as specified in Clause 4 to determine the relevant 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).

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

Categories, notes, comments etc, which are shown grey shaded should not be used in bituminous mixtures.

4.2 Aggregate sizes

All aggregates shall be described in terms of aggregate sizes using the designations d/D and shall conform to 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 Rounded sizes shown in parentheses can be used as simplified descriptions of aggregate sizes.		

NOTE For special end use in surface treatments a sieve size of 2,8 mm can be used in set 2.

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 six months, shall fall within the limits specified in Tables 2 to 4 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 manufacturer and purchaser.

Where the specification requires the use of sieves which are a fraction or a multiple of the upper sieve size (e.g. $D/2$ or $D/1{,}4$ or $1{,}4D$, $2D$) 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	$d/2$	
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.

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.

When required, for graded aggregates, defined as those where $D/d \geq 2$, all gradings shall conform 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	$\pm$ 15	$G_{25/15}$
		20 to 70	$\pm$ 15	$G_{20/15}$
≥ 4	$D/2$	20 to 70	$\pm$ 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 comply with 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_AXY.

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	$D/2$	0,250[b]	0,063[a]	**Category** G_{TC}
Tolerances Percentage passing by mass	$\pm$ 5	$\pm$ 10[a]	$\pm$ 20	$\pm$ 3	$G_{TC}10$
	$\pm$ 5	$\pm$ 20	$\pm$ 25	$\pm$ 5	$G_{TC}20$
	$\pm$ 7,5	$\pm$ 25	$\pm$ 25	$\pm$ 5	$G_{TC}25$
		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 aggregates 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 $2D$, $1,4D$, D, d, $d/2$. The grading category shall be

quoted as D_GX/Y to indicate clearly that it is a declared or special use category. The aggregate shall conform to the grading requirements specified.

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 manufacturer and purchaser.

4.3.6 Grading of 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 of 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 aggregate	≤ 3	f_3
	≤ 5	f_5
	≤ 7	f_7
	≤ 10	f_{10}
	≤ 16	f_{16}
	> 16	$f_{Declared}$
	No requirement	f_{NR}
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
	≤ 6	F_6
	≤ 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 with $D \leq 8$ mm, 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)* of 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	$MB_{0/2}$
	≤ 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	$MB_A0{,}8$
	≤ 1	MB_A1
	> 1	$MB_ADeclared$
	No requirement	MB_ANR

[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.

If the fines content is greater than 10 % by mass, it shall satisfy the other relevant requirements for filler aggregate specified in 8.5.

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 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 fine 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	$E_{cs}38$
≥ 35	$E_{cs}35$
≥ 30	$E_{cs}30$
< 30	$E_{cs}Declared$
No requirement	$E_{cs}NR$

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 aggregates shall be tested as specified in Clause 5 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 60 corresponds to LA_{60}.

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).

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

Categories, notes, comments etc. which are grey shaded should not be used in bituminous mixtures.

5.2 Resistance to fragmentation

When required, the resistance to fragmentation 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	$M_{DE}10$
≤ 15	$M_{DE}15$
≤ 20	$M_{DE}20$
≤ 25	$M_{DE}25$
≤ 30	$M_{DE}30$
≤ 35	$M_{DE}35$
≤ 40	$M_{DE}40$
≤ 45	$M_{DE}45$
≤ 50	$M_{DE}50$
> 50	M_{DE}Declared
No requirement	M_{DE}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 density) and the results declared.

5.4.2 Water absorption

When required, the water absorption shall be determined in accordance with the appropriate clause of EN 1097-6 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 Resistance to polishing for application in surface courses

When required, the resistance to polishing for surface courses aggregate (polished stone value — *PSV*) shall be determined in accordance with EN 1097-8 and the results declared in accordance with the relevant category specified in Table 16.

Table 16 — Categories for minimum values of resistance to polishing

Polished stone value	Category *PSV*
≥ 68	PSV_{68}
≥ 62	PSV_{62}
≥ 56	PSV_{56}
≥ 50	PSV_{50}
≥ 44	PSV_{44}
Intermediate values and those < 44	$PSV_{Declared}$
No requirement	PSV_{NR}

5.7 Resistance to surface abrasion

When required, the resistance to surface abrasion (aggregate abrasion value — *AAV*) shall be determined in accordance with EN 1097-8 and the results declared in accordance with the relevant category specified in Table 17.

Table 17 — Categories for maximum values of resistance to surface abrasion

Aggregate abrasion value	Category *AAV*
≤ 10	AAV_{10}
≤ 15	AAV_{15}
≤ 20	AAV_{20}
> 20	$AAV_{Declared}$
No requirement	AAV_{NR}

5.8 Resistance to abrasion from studded tyres for application in surface courses

When required, the resistance to abrasion from studded tyres (Nordic abrasion value - A_N) shall be determined in accordance with EN 1097-9 and the results declared in accordance with the relevant category specified in Table 18.

Table 18 — Categories for maximum values of resistance to abrasion from studded tyres

Nordic abrasion value	Category A_N
≤ 5	A_N5
≤ 7	A_N7
≤ 10	A_N10
≤ 14	A_N14
≤ 19	A_N19
≤ 30	A_N30
Intermediate values and those > 30	A_NDeclared
No requirement	A_NNR

5.9 Affinity to bituminous binder

When required, the affinity to bituminous binders shall be determined in accordance with EN 12697-11, method A, 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 aggregates shall be tested as specified in Clause 6 to determine the relevant chemical properties

When the value of a property is required but not defined by specified limits the value should be declared as an $XY_{Declared}$ category, e.g. a value of say 11 percent by volume for the expansion of steel slag aggregate corresponds to V_{11} (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).

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

Categories, notes, comments etc., which are grey shaded should not be used in bituminous mixtures.

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 Coarse lightweight contaminators

When required, the content of coarse lightweight organic contaminators larger than 2 mm shall be determined in accordance with EN 1744-1 and the results declared in accordance with the relevant category specified in Table 19 according to the particular application or end use.

Table 19 — Categories for maximum values of the content of coarse matter

Percentage of coarse matter	Category m_{LPC}
≤ 0,1	$m_{LPC}0,1$
≤ 0,5	$m_{LPC}0,5$
> 0,5	m_{LPC}Declared
No requirement	m_{LPC}NR

6.4 Constituents which affect the volume stability of blast furnace and steel slag

6.4.1 Dicalcium silicate disintegration of air-cooled blast furnace slag

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

6.4.2 Iron disintegration of air-cooled blast furnace slag

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

6.4.3 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 20 according to the particular application or end use. For determination of the MgO content the relevant test specified in EN 196-2 shall be used and the results declared.

Table 20 — Categories for maximum expansion values for steel slag

Type of steel slag	Expansion 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.

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

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 producers 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 aggregates shall be tested as specified in Clause 7 to determine the relevant durability properties.

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 aggregates standards: EN 12620, EN 13043, EN 13139 and EN 13242.

Categories, notes, comments etc., which are grey shaded should not be used in bituminous mixtures.

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 21.

Table 21 — 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}

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, is not greater than the value selected as one of the categories specified in Table 22, the aggregate shall be assumed to be freeze-thaw resistant.

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

Table 22 — 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 23.

Table 23 — 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 1), the resistance to freezing and thawing shall be determined in accordance with EN 1367-6 and the results shall be declared in accordance with the relevant category specified in Table 24. In this case, the resistance to freezing and thawing (see 7.3.2) shall not be determined.

NOTE 1 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.

NOTE 2 This test has been found to be appropriate for certain petrographic types of aggregate (e.g. basalts) under severe conditions of use and might not be universally applicable to all rock types.

Table 24 — Categories for maximum freeze-thaw resistance in the presence of salt

Freeze-thaw Percentage loss of mass	**Category** F_{EC}
≤ 2	$F_{EC}2$
≤ 4	$F_{EC}4$
≤ 5	$F_{EC}5$
≤ 6	$F_{EC}6$
≤ 8	$F_{EC}8$
≤ 14	$F_{EC}14$
≤ 25	$F_{EC}25$
≤ 50	$F_{EC}50$
> 50	$F_{EC\text{-}Declared}$
No requirement	$F_{EC\text{-}NR}$
NOTE When tests using de-icing solutions other than NaCl, the limits of Table 24 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 25 according to the particular application or end use.

Table 25 — Categories for maximum values of resistance to "Sonnenbrand"

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

7.5 Resistance to thermal shock

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

8 Requirements for filler aggregate

8.1 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 8 shall be carried out to determine the appropriate properties.

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 31 a value of say 15 % by mass corresponds to WS_{15} (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.

The requirements specified in this clause apply to added filler. The requirements specified in 8.2.2, 8.3.2 and 8.4.1 also apply to the 0 mm to 0,125 mm fraction taken from fine aggregate, or all-in aggregate with $D \leq 8$ mm, containing more than 10 % of fines by mass (see 4.5).

The size fraction 0 mm to 0,125 mm used for the specific test methods specified in EN 933-9, EN 1097-4, EN 1097-7, EN 1744-1 and EN 13179-1 is obtained in accordance with EN 933-1 (without washing as specified in EN 933-1) from the filler fraction taken from the fine aggregate containing more than 10 % fines. Special care has to be taken to extract the entire size fraction, taking into account the results of the particle size distribution.

NOTE 3 Where conformity with a category, other than grading, 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).

8.2 Geometrical requirements

8.2.1 Grading for added filler

The grading shall be determined in accordance with EN 933-10 and shall conform to the values specified in Table 26.

Table 26 — Grading requirements for added filler

Sieve size mm	Percentage passing by mass	
	Overall range for individual results	Producer'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 (see EN 16236). 90 % of the results declared shall be within this range, but all the results shall be within the overall grading range (see column 2 above).

8.2.2 Harmful fines

When required, the harmful fines (e.g. swelling clay) shall be determined as the methylene blue value (MB_F) in accordance with EN 933-9. The methylene blue value shall be declared in accordance with the relevant category specified in Table 27.

Table 27 — Categories for maximum methylene blue (MB_F) values

MB_F value g/kg	Category MB_F
≤ 7	MB_F7
≤ 10	MB_F10
≤ 25	MB_F25
> 25	MB_FDeclared
No requirement	MB_FNR

8.3 Physical requirements

8.3.1 Water content

When required, the water content of the added filler shall be determined in accordance with EN 1097-5 and the results declared in accordance with the relevant category specified in Table 28 according to the particular application or end use.

Table 28 — Categories for maximum values of water content

Water content percentage by mass	Category *WC*
≤ 1	WC_1
> 1	$WC_{Declared}$
No requirement	WC_{NR}

8.3.2 Particle density

The particle density shall be determined in accordance with EN 1097-7 and the results declared.

8.3.3 Stiffening properties

8.3.3.1 Voids of dry compacted filler (Rigden)

When required, the voids of dry compacted filler shall be determined in accordance with EN 1097-4 and the results declared in accordance with the relevant category specified in Table 29 according to the particular application or end use.

Table 29 — Categories for voids of dry compacted filler

Percentage by volume		Category *v*
Overall range for individual results	Producer's maximum declared grading range [a]	
28 to 38	4	$v_{28/38}$
38 to 45	4	$v_{38/45}$
28 to 45	4	$v_{28/45}$
44 to 55	4	$v_{44/55}$
No requirement	No requirement	v_{NR}

[a] Declared range of voids of dry compacted filler on the basis of the last 20 values (see EN 16236). 90 % of the results as calculated, shall be within this range, but all the results shall be within the overall range (see column 1 above)

8.3.3.2 "Delta ring and ball" of filler aggregate

When required, the "delta ring and ball" shall be determined in accordance with EN 13179-1 and the results declared in accordance with the relevant category specified in Table 30 according to the particular application or end use.

Table 30— Categories for the range of "delta ring and ball" of filler aggregate

Delta ring and ball °C	Category $\Delta_{R\&B}$
8 to 16	$\Delta_{R\&B}8/16$
17 to 25	$\Delta_{R\&B}17/25$
8 to 25	$\Delta_{R\&B}8/25$
> 25	$\Delta_{R\&B}25$
No requirement	$\Delta_{R\&B}NR$

8.4 Chemical requirements

8.4.1 Water solubility

When required, the water solubility shall be determined in accordance with EN 1744-1 and the results declared in accordance with the relevant category specified in Table 31 according to the particular application or end use.

Table 31 — Categories for maximum values of water solubility

Water solubility Percentage by mass	Category *WS*
≤ 10	WS_{10}
> 10	$WS_{Declared}$
No requirement	WS_{NR}

8.4.2 Water susceptibility

When required, the water susceptibility shall be determined in accordance with EN 1744-4 and the results declared.

In case of intensive turbidity of the supernatant liquid and/or in case of the presence of filler particles not enveloped/surrounded by bitumen and/or if there is any suspicion, that swellable clay minerals are present, swelling shall not exceed 1,0 % by volume.

8.4.3 Carbonate content of filler aggregate

When required, the carbonate content of filler aggregate shall be determined in accordance with EN 196-2 (carbon dioxide method) and the results declared in accordance with the relevant category specified in Table 32 according to the particular application or end use.

Table 32 — Categories for minimum values of carbonate content of filler aggregate

Carbonate content Percentage by mass	**Category** CC_f
≥ 90	CC_f 90
≥ 80	CC_f 80
≥ 70	CC_f 70
≥ 60	CC_f 60
< 60	CC_f Declared
No requirement	CC_f NR

8.4.4 Calcium carbonate content of limestone filler aggregate

When required, for limestone filler aggregate the calcium carbonate content shall be determined in accordance with EN 196-2 (calcium oxide method) and the results declared in accordance with the relevant category specified in Table 33 according to the particular application or end use.

It is necessary to differentiate between calcium carbonate and magnesium carbonate content by using a different test method (e.g. EN 196-2).

Table 33 — Categories for minimum values of calcium carbonate content of limestone filler aggregate

Calcium carbonate content Percentage by mass	**Category** CC_l
≥ 90	CC_l90
≥ 80	CC_l80
≥ 70	CC_l70
≥ 60	CC_l60
< 60	CC_lDeclared
No requirement	CC_lNR

NOTE 1 In EN 196-2 the test result is specified as the calcium oxide content. For the calculation of the calcium carbonate content, the calcium oxide content is multiplied by a factor of 1,7848.

If the calcium carbonate content is < 60, the total carbonate content ($CaCO_3$ + $MgCO_3$) should be declared.

NOTE 2 In EN 196-2 the test result is specified as the magnesium oxide content. For the calculation of the magnesium carbonate content, the magnesium carbonate content is multiplied by a factor of 2,093.

8.4.5 Calcium hydroxide content of mixed filler

When required, the calcium hydroxide content of mixed filler shall be determined by determining the calcium oxide content in accordance with EN 459-2 and multiplying the result by a factor of 1.3213. The results declared in accordance with the relevant category specified in Table 34.

Table 34 — Categories for minimum values of calcium hydroxide content

Calcium hydroxide content Percentage by mass	Category Ka
≥ 25	Ka_{25}
≥ 20	Ka_{20}
≥ 10	Ka_{10}
< 10	$Ka_{Declared}$
No requirement	Ka_{NR}

8.5 Requirements for consistency of filler production

8.5.1 General

The consistency of filler production shall be measured on at least one of the following properties.

8.5.2 "Bitumen number" of added filler

When required, the "bitumen number“ of added filler concerning the consistency of the stiffening properties shall be determined in accordance with EN 13179-2 and the results declared in accordance with the relevant category specified in Table 35 according to the particular application or end use.

Table 35 — Requirements of “bitumen number” of added filler

Overall range for individual results %	Producer's maximum declared “bitumen number” range[a] %	Category *BN*
28 to 39	6	$BN_{28/39}$
40 to 52	6	$BN_{40/52}$
53 to 62	6	$BN_{53/62}$
Declared	Declared	$BN_{Declared}$
No requirement	No requirement	BN_{NR}

[a] Declared “bitumen number” range on the basis of the last 20 values (see EN 16236). 90 % of the results as calculated shall be within this range, but all the results shall be within the overall “bitumen number" range (see Column 1 above).

8.5.3 Loss on ignition of coal fly ash

The loss on ignition of pulverized coal fly ash used as filler shall be determined in accordance with EN 1744-1. The producer’s declared range shall be not greater than 6 % by mass.

If aggregates contain non-volatile oxidizable constituents, as in the case of blast furnace slags, the loss on ignition shall be corrected in accordance with of EN 196-2.

8.5.4 Particle density of added filler

The particle density of added filler shall be determined in accordance with EN 1097-7. The producer's declared range shall be not greater than 0,2 Mg/m^3.

8.5.5 Loose bulk density in kerosene

The loose bulk density in kerosene shall be determined in accordance with EN 1097-3. The producer's declared range shall be within 0,5 Mg/m^3 and 0,9 Mg/m^3.

8.5.6 Specific surface area

Specific surface shall be determined in accordance with EN 196-6 "Blaine method". The producer's declared value shall be not greater than 140 m^2/kg. Also nitrogen adsorption method (ISO 9277) may be used. The declared range shall be not greater than 5,0 m^2/g.

9 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 producer in accordance with EN 16236.

10 Designation

10.1 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 as described in Annex A – specific material;

c) aggregate size.

10.2 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.1a) and Table ZA.1b).

11 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 Z.A.3 to have additional information Included on the delivery ticket.

Annex A
(normative)

Source materials considered in the development of EN 13043 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 13043.

Sources with no history of use in bituminous mixtures are outside the scope of the standard and should not be used as aggregate in conformity with this standard, and are therefore grey shaded in Table A.1.

Sources with positive history of use and no identification of the need for additional requirements are 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).

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, shall comply fully with this standard but might 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 13043 aggregates

Nr.	Source	Sub-number.	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	No	No
		A2	Crushed concrete	No	–	–
		A3	Crushed bricks, masonry	No	–	–
		A4	Mix of A1, A2 and A3	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)	Yes (Only as a component of composite filler[b])	No	No
C	Coal Power generation industry	C1	Coal fly ash	Yes	Yes	No
		C2	Fluidized bed combustion fly ash (FBCFA)	Yes	Yes	No
		C3	Boiler slag	Yes	No	No
		C4	Coal bottom ash	No	–	–
		C5	Fluidized bed combustion bottom ash (FBC bottom ash)	No	–	–

Table A.1 (*continued*)

Nr.	Source	Sub-number	Specific material	History of use	Special requirements in standard	Additional requirements identified for inclusion
D	Iron and steel industry	D1	Granulated blast furnace slag (GBS) (vitrified)	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)	Yes	Yes	No
		D6	Ferrochromium slag	Yes	Yes	No
E	Non-ferrous industry	E1	Copper slag	Yes	No	No
		E2	Molybdenum slag	Yes	No	No
		E3	Zinc slag	No	–	–
		E4	Phosphorus slag	Yes	No	No
F	Foundry industry	F1	Foundry sand	Yes	No	Yes
		F2	Foundry cupola furnace slag	Yes	No	Yes
G	Mining and quarry industry	G1	Red coal shale	No	–	–
		G2	Refuse from hard coal mining (black coal shale)	No	–	–
		G3	Pre-selected all-in from quarry/mining	No	–	–
		G4	Spent oil shale	No	–	–
H	Maintenance dredging works	H1	Dredge spoil sand	No	–	–
		H2	Dredge spoil clay	No	–	–

Table A.1 (*continued*)

Nr.	Source	Sub-number	Specific material	History of use	Special requirements in standard	Additional requirements identified for inclusion
I	Miscellaneous	I1	Excavated soil	No	–	–
		I2	Paper sludge ash	Yes (Only as a component of composite filler[b])	No	No
		I3	Sewage sludge incineration ash (municipal)	Yes (Only as a component of composite filler[b])	No	No
		I4	Biomass ash	Yes (Only as a component of composite filler[b])	No	No
		I5	Crushed glass	Yes	No	No
		I6	Expanded clay	See prEN 13055	–	–

[a] Requirements on MIBA are based on experience with grated installations.

[b] Filler aggregate of mineral origin, which has been produced using 2 or more sources of Table A.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the 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 EC 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/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 Tables ZA.1a) and ZA.1b)).

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

Product: Aggregates obtained by processing natural or manufactured or recycled materials. **Intended use(s):** Bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.				
Essential Characteristics	**Requirement clauses in this and other standard(s)**		**Levels and/or classes**	**Notes**
Particle shape, size and density	4.2	Aggregate size	None	Designation (d/D)
	4.3	Grading	None	Tolerance category
	4.6	Particle shape of coarse and all-in 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 and broken particles	None	Category
Affinity to bituminous binders	5.9	Affinity to bituminous binders	None	Declared value
Resistance to fragmentation/crushing	5.2	Resistance to fragmentation	None	Category
Resistance to polishing/abrasion/ wear/attrition	5.6	Resistance to polishing for surface courses	None	Category
	5.7	Resistance to surface abrasion	None	Category
	5.3	Resistance to wear	None	Category
Resistance to thermal shock	7.5	Resistance to thermal shock	None	Declared value
Volume stability				
	6.4.1	Dicalcium silicate disintegration of air-cooled blast furnace slag	None	Pass/fail
	6.4.2	Iron disintegration of air-cooled blast furnace slag	None	Pass/fail
	6.4.3	Volume stability of steel slag	None	Category
Composition/content	6.2	Petrographic description	None	Declared value

Table ZA.1a) (*continued*)

Essential Characteristics	Requirement clauses in this and other standard(s)	Levels and/or classes	Notes
Dangerous substances: Emission of radioactivity Release of heavy metals Release of polyaromatic hydrocarbons Release of other dangerous substances	NOTE In ZA.1 above: EN 16236:2013, 6.3.4 Knowledge of the raw material EN 16236:2013, 5.3.5 Management of production	None None None	See third paragraph of ZA.3
Durability	7.2 Magnesium sulfate soundness of coarse aggregates 7.3 Freeze-thaw resistance 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) 7.4 “Sonnenbrand” of basalt	None	Category
Durability against studded tyres	5.8 Resistance to abrasion from studded tyres to be used for surface courses	None	Category
Durability against thermal shock	7.5 Resistance to thermal shock	None	Declared value

Table ZA 1b) – Scope and characteristics meeting Mandate M/125 and relevant clauses

Product: Fillers obtained by processing natural or manufactured or recycled materials **Intended use(s):** Bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.			
Essential Characteristics	**Requirement clauses in this and other standard(s)**	**Levels and/or classes**	**Notes**
Fineness/Particle size and density	8.2.1 Grading for added fillers	None	Pass/fail threshold value
	8.3.2 Particle density	None	Declared value
Stiffening properties	8.3.3.1 Voids of dry compacted filler (Rigden)	None	Category
	8.3.3.2 "Delta ring and ball" of filler aggregate	None	Category
	8.5.2 "Bitumen number" of added filler	None	Category
Water solubility and susceptibility	8.4.1 Water solubility	None	Category
	8.4.2 Water susceptibility	None	Declared value
Cleanliness	8.2.2 Harmful fines	None	Category
Porosity/volume of voids	8.3.3.1 Voids of dry compacted filler (Rigden)	None	Category
Loss on ignition (for fly ashes only)	8.5.3 Loss on ignition of coal fly ash	None	Declared value with threshold value
Release of dangerous substances	NOTE In ZA.1 above	None	
	EN 16236:2013, 6.3.4 Knowledge of the raw material	None	
	EN 16236:2013, 5.3.5 Management of production	None	

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 and fillers indicated in Table ZA.1a) and Table ZA.1b), 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) — System(s) of attestation of conformity for aggregates and fillers 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 bituminous mixtures and surface treatments	For roads and other civil engineering works	–	2+
Fillers for bituminous mixtures and surface treatments	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) — System(s) of attestation of conformity for aggregates and fillers 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 bituminous mixtures and surface treatments	For roads and other civil engineering works	–	4
Filler for bituminous mixtures and surface treatments	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 and fillers in Table ZA.1a) and Table ZA.1b) shall be based on the evaluation of conformity procedures indicated in Table(s) 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 and fillers 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.1a) or Table ZA.1b)	9 and 5 of EN 16236:2013
	Initial type testing by the manufacturer		All relevant characteristics of Table ZA.1a) or Table ZA.1b)	9 and 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.1a) or Table ZA.1b)	9 and 5 of EN 16236:2013
		Continuous surveillance, assessment and approval of F.P.C.	Parameters related to all relevant characteristics of Table ZA.1a) or Table ZA.1b)	9 and 5 of EN 16236:2013

Table ZA.3b) — Assignation of evaluation of conformity tasks (for aggregates and fillers 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.1a) or Table ZA.1b)	9 and 5 of EN 16236:2013
	Initial type testing	All relevant characteristics of Table ZA.1a) or Table ZA.1b)	9 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 number of the accompanying factory production control certificate, and FPC records, 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 and certificate shall be presented in the language or languages accepted in 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 producer or his agent established in the EEA shall draw up and retain a declaration of conformity (EC 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 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 producer or of his authorised representative.

The above mentioned declaration shall be presented in the language or languages accepted in 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 documents. The following information shall accompany the CE marking symbol:

— identification number of the certification body (in case of products following Table ZA.3a));

— 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 (in case of products following Table ZA.3a));

— reference to this European Standard with date of version (EN 13043:2013);

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

— information on the relevant essential characteristics in Tables ZA.1a or ZA.1b namely:

  — values and, where relevant, the class to declare for each relevant characteristic;

  — 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.

Figures ZA.1, ZA.2, ZA.3 and ZA.4 give examples of the information to be given on the product, label, packaging and/or commercial documents.

CE	
01234	
Any Co Ltd, PO Box 21, B-1050	
13	
0123-CPD-0456	
EN 13043:2013	
Aggregates for bituminous mixtures	
Particle shape	Category (e.g. FI_{10})
Particle size	Designation (d/D) & (e.g. G_c85/15) Tolerance category (e.g. $G_{20/15}$)
Particle density	Declared value (Mg/m^3)
Cleanliness	Category (e.g. MB_{F10})
Affinity to bituminous binders	Declared value % degree of bitumen coverage
Percentage of crushed particles/broken surfaces	Category (e.g. $C_{90/1}$)
Resistance to fragmentation/ crushing	Category (e.g. LA_{30})
Resistance to polishing/ abrasion/wear	
Polished stone value	Category (e.g. PSV_{50})
Aggregate abrasion value	Category (e.g. AAV_{20})
Resistance to wear of coarse aggregate	Category (e.g. M_{DE35})
Abrasion from studded tyres	Category (e.g. AN_{19})
Resistance to thermal shock	Declared value (V_{LA} or V_{SZ})
Volume stability	
Magnesium sulfate soundness	Category (e.g. MS_{25})
Dicalcium silicate disintegration of air-cooled blast furnace slag	Declared value Pass/fail
Iron disintegration of air-cooled blast furnace slag	Declared value Pass/fail
Volume stabiliy of steel slag aggregates	Category (e.g. $V_{6,5}$)
Composition/content	Declared value Description
Emission of radioactivity **Release of heavy metals** **Release of polyaromatic carbons**	}
Release of other dangerous substances	
Durability against freeze/thaw	Category (e.g. WA_1, F_4,or FS_8)
Durability against weathering	Category (e.g. $SB_{1/8}$)
Durability against studded tyres	Category (e.g. AN_{19})
Durability against thermal shock	Declared value (V_{LA} or V_{sz})

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 producer

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

Number of the EC certificate

N° 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 13043:2013

Aggregates for bituminous mixtures

Particle shape	Category (e.g. FI_{10})
Particle size	Designation (d/D) & (e.g. G_c85/15) Tolerance category $G_{20/15}$
Particle density	Declared value (Mg/m^3)
Cleanliness	Category (e.g. MB_{F10})
Affinity to bituminous binders	Declared value % degree of bitumen coverage
Percentage of crushed particles/broken surfaces	Category (e.g. $C_{90/1}$)
Resistance to fragmentation/ crushing	Category (e.g. LA_{30})
Resistance to polishing/ abrasion/wear	
Polished stone value	Category (e.g. PSV_{50})
Aggregate abrasion value	Category (e.g. AAV_{20})
Resistance to wear of coarse aggregate	Category (e.g. M_{DE35})
Abrasion from studded tyres	Category (e.g. AN_{19})
Resistance to thermal shock	Declared value (V_{LA} or V_{SZ})
Volume stability	
Magnesium sulfate soundness	Category (e.g. MS_{25})
Dicalcium silicate disintegration of air-cooled blast furnace slag	Declared value Pass/fail
Iron disintegration of air-cooled blast furnace slag	Declared value Pass/fail
Volume stabiliy of steel slag aggregates	Category (e.g. $V_{6,5}$)
Composition/content	Declared value Description
Emission of radioactivity **Release of heavy metals** **Release of polyaromatic carbons**	}
Release of other dangerous substances	
Durability against freeze/thaw	Category (e.g. WA_1, F_4 or FS_8)
Durability against weathering	Category (e.g. $SB_{1/8}$)
Durability against studded tyres	Category (e.g. AN_{19})
Durability against thermal shock	Declared value (V_{LA} or V_{sz})

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

Name or identifying mark and registered address of the producer

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

N° 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

CE **01234**	
Any Co Ltd, PO Box 21, B-1050 **13** **0123-CPD-0456**	
EN 13043:2013 **Filler aggregates for bituminous mixtures and surface treatment for roads, airfields and other trafficked areas**	
Fineness/Particle size	Declared values % passing and cm^2/g
Particle density	Declared value Mg/m^3
Stiffening properties	
Voids of dry compacted filler	Category (e.g. $V_{44/55}$)
Delta ring and ball	Category (e.g. $\Delta_{R\&B}17/25$)
Bitumen number of added filler	Category (e.g. $BN_{53/62}$)
Water solubility and susceptibility	Category (e.g. WS_{10}) and declared value
Cleanliness	Category (e.g. MB_{F10})
Porosity/volume of voids	Category (e.g. $v_{28/38}$)
Loss on ignition (*for ashes only*)	Declared value (e.g. %)
Release of dangerous substances	

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 producer

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

Number of the EC certificate

N° of European Standard with date of version

Description of product

and

information on product and on regulated characteristics

Figure ZA.3 — Example of CE marking information for fillers under system 2+

CE	
Any Co Ltd, PO Box 21, B-1050	
13	
EN 13043:2013	
Filler aggregates for bituminous mixtures and surface treatment for roads, airfields and other trafficked areas	
Fineness/Particle size	Declared values % passing and cm^2/g
Particle density	Declared value Mg/m^3
Stiffening properties	
Voids of dry compacted filler	Category (e.g. $V_{44/55}$)
Delta ring and ball	Category (e.g. $\Delta_{R\&B}17/25$)
Bitumen number of added filler	Category (e.g. $BN_{53/62}$)
Water solubility and susceptibility	Category (e.g. WS_{10}) and declared value
Cleanliness	Category (e.g. MB_{F10})
Porosity/volume of voids	Category (e.g. $v_{28/38}$)
Loss on ignition (*for ashes only)*	Declared value (e.g. %)
Release of dangerous substances	

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

Name or identifying mark and registered address of the producer

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

N° of European Standard with date of version

Description of product

and

information on product and on regulated characteristics

Figure ZA.4 — Example of CE marking information for fillers 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.

This page deliberately left blank

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.™