

BS EN 12620:2013



BSI Standards Publication

# Aggregates for concrete

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### National foreword

This British Standard is the UK implementation of EN 12620:2013. It supersedes BS EN 12620:2002 which is withdrawn.

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.

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Published by BSI Standards Limited 2013

ISBN 978 0 580 69714 2

ICS 91.100.15; 91.100.30

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

### Amendments issued since publication

Date	Text affected
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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12620**

May 2013

ICS 91.100.15

Supersedes EN 12620:2002+A1:2008

English Version

**Aggregates for concrete**

Granulats pour béton

Gesteinskörnungen für Beton

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.

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## Foreword

This document (EN 12620:2013) 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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by February 2015.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 12620:2002+A1:2008.

Requirements for other end uses of aggregates are specified in the following European Standards:

- 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 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.

## 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 concrete in conformity with EN 206-1 and concrete used in roads and other pavements and for use in precast concrete products.

It covers aggregates having an oven dried particle density greater than  $2,0 \text{ Mg/m}^3$  ( $2000 \text{ Kg/m}^3$ ). It also covers recycled aggregate with particle densities greater than  $1,50 \text{ Mg/m}^3$  ( $1\,500 \text{ kg/m}^3$ ) 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 in concrete.

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

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

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

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

EN 933-10, *Tests for geometrical properties of aggregates — Part 10: Assessment of fines — Grading of 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 1097-8, *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 1367-4, *Tests for thermal and weathering properties of aggregates — Part 4: Determination of drying shrinkage*

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 1744-1:2009, *Tests for chemical properties of aggregates — Part 1: Chemical analysis*

EN 1744-5, *Tests for chemical properties of aggregates — Part 5: Determination of acid soluble chloride salts*



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 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  $G_nX/Y$  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**

#### **finer**

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 and 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**

#### **natural graded 0/8 mm aggregate**

designation given to natural aggregate of glacial and/or fluvial origin with  $D$  less than or equal to 8 mm

Note 1 to entry: This aggregate can also be produced by blending processed aggregate.

### **3.12**

#### **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.

### **3.13**

#### **filler aggregate**

fine aggregate, most of which passes a 0,063 mm sieve

### **3.14**

#### **added filler**

filler aggregate, which has been produced separately, which can be added to construction materials to provide certain properties

### **3.15**

#### **particle size fraction**

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

Note 1 to entry: The lower limit can be zero.

### **3.16**

#### **oversize**

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

### 3.17

#### **undersize**

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

### 3.18

#### **batch**

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

Note 1 to entry: With a continuous process the quantity produced during a specified period should be treated as a batch.

## 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  $XX_{\text{Declared}}$  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 aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242.

Categories, notes, comments etc, which are grey shaded, shall not be used in concrete.

### 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 described by the pair of sieve sizes in millimetres selected from the basic set, or the basic set plus set 1, or the basic set plus set 2 in Table 1 with  $d$  as the lower limit designation and  $D$  as the upper limit designation sieve between which most of the particle size distribution lies, (e.g. 0/4mm, 0/2mm, 2/4mm etc.).

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**

<b>Basic set</b> mm	<b>Basic set plus set 1</b> mm	<b>Basic set plus set 2</b> mm
<b>0</b>	<b>0</b>	<b>0</b>
<b>1</b>	<b>1</b>	<b>1</b>
<b>2</b>	<b>2</b>	<b>2</b>
<b>4</b>	<b>4</b>	<b>4</b>
—	<b>5,6 (5)</b>	—
—	—	<b>6,3 (6)</b>
<b>8</b>	<b>8</b>	<b>8</b>
—	—	<b>10</b>
—	<b>11,2 (11)</b>	—
—	—	<b>12,5 (12)</b>
—	—	<b>14</b>
<b>16</b>	<b>16</b>	<b>16</b>
—	—	<b>20</b>
—	<b>22,4 (22)</b>	—
<b>31,5 (32)</b>	<b>31,5 (32)</b>	<b>31,5 (32)</b>
—	—	<b>40</b>
—	<b>45</b>	—
—	<b>56</b>	—
<b>63</b>	<b>63</b>	<b>63</b>
—	—	<b>80</b>
—	<b>90</b>	—
NOTE Rounded sizes shown in parentheses can be used as simplified descriptions of aggregate sizes.		

### 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 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 (eg  $D/2$  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  $d/2$ ,  $D/1,4$ ,  $D/2$  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	$D > 4$	100	100	90 to 99	0 to 10	0 to 2	$G_C 90/10$
		100	98 to 100	90 to 99	0 to 15	0 to 5	$G_C 90/15$
	$d \geq 1$	100	98 to 100	85 to 99 <sup>c</sup>	0 to 15	0 to 5	$G_C 85/15$
		100	98 to 100	85 to 99 <sup>c</sup>	0 to 20	0 to 5	$G_C 85/20$
		100	98 to 100	80 to 99	0 to 20	0 to 5	$G_C 80/20$
		100	98 to 100	85 to 99	0 to 35	0 to 5	$G_C 85/35$
		100	98 to 100	85 to 99 <sup>c</sup>	0 to 15	0 to 2	$G_{CA} 85/15$
		100	98 to 100	85 to 99 <sup>c</sup>	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	--	$G_G 85/15$
		100	98 to 100	85 to 99	0 to 20	0 to 5	$G_G 85/20$
100		98 to 100	85 to 99	0 to 35	0 to 5	$G_G 85/35$	
Natural Graded Aggregates	$D = 8$ $d = 0$	100	98 to 100	90 to 99	-	-	$G_{NG} 90$
Fine	$D \leq 4$ $d = 0$	100	95 to 100	85 to 99	-	-	$G_F 85$
All-in	$D > 4$	100	98 to 100	90 to 99	-	-	$G_A 90$
		100	98 to 100	85 to 99	-	-	$G_A 85$
	$d = 0$	100	98 to 100	80 to 99	-	-	$G_A 80$
		100	-	75 to 99	-	-	$G_A 75$

<sup>a</sup> For aggregate sizes where  $D$  is greater than 63 mm (e.g. 80 mm and 90 mm as mentioned in EN 13242) only the oversize requirements related to the  $1,4 D$  sieve apply since there is no ISO 565/R20 series sieve above 125 mm.

<sup>b</sup> 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 set 2 intermediate between  $d$  and  $D$ .

<sup>c</sup> For single size coarse aggregates  $d/D$ , where  $D/d < 2$ , of the categories  $G_C 85/15$  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  $G_C X/Y$ .

When required for graded coarse aggregates, defined as those where  $D/d \geq 2$  mm and  $D > 11,2$  mm or  $D/d > 4$  mm and  $D \leq 11,2$  mm, all gradings shall conform to the overall limits in Table 3. 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**

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

#### 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<sub>F85</sub>*.

When required the typical grading, in terms of the percentages passing the 4mm, 2mm, 1mm, 0,250mm and 0,063mm 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<sub>A</sub>X/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.

When required, all in aggregate for concrete shall, additionally, comply with the grading limits at intermediate sieves from Table 5 appropriate to their upper sieve size *D*.

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

Sieve size mm	<i>D</i>	<i>D/2</i>	0,250 <sup>b</sup>	0,063 <sup>a</sup>	Category <i>G<sub>TC</sub></i>
Tolerances Percentage passing by mass	± 5	± 10 <sup>a</sup>	± 20	± 3	<i>G<sub>TC</sub>10</i>
	± 5	± 20	± 25	± 5	<i>G<sub>TC</sub>20</i>
	± 7,5	± 25	± 25	± 5	<i>G<sub>TC</sub>25</i>
	<b>No requirement</b>				<i>G<sub>TC</sub>NR</i>
<sup>a</sup> In all cases the upper limit determined by fines category takes preference					
<sup>b</sup> Requirements on 0.250 mm sieve are only for fine aggregates					

**Table 5 — Overall limits for all-in aggregate at intermediate sieves**

Size mm	Overall limits at intermediate sieves (Percentage passing by mass)			
	<i>D</i> /2	4 mm	2 mm	1 mm
$D \leq 10$	<b>50 to 90</b>	—	—	<b>20 to 60</b>
$10 < D < 32$	<b>50 to 90</b>	—	<b>20 to 60</b>	—
$D \geq 32$	<b>50 to 90</b>	<b>20 to 60</b>	—	—

NOTE Tolerances are further limited by the requirements for the percentage passing the appropriate sieve.

#### 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  $D_G X/Y$  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 6.

**Table 6 — Grading requirements for added filler**

Sieve size mm	Percentage passing by mass	
	Overall range for individual results	Manufacturer's maximum declared grading range <sup>a</sup>
2	<b>100</b>	—
0,125	<b>85 to 100</b>	<b>10</b>
0,063	<b>70 to 100</b>	<b>10</b>

<sup>a</sup> Declared grading range on the basis of the last 20 values. 90 % of the results shall be within this range, but all the results shall be within the overall grading range .

#### 4.3.7 Natural graded 0/8 mm aggregates

Natural graded 0/8 mm aggregates shall conform to the general grading requirements specified in Table 2.

The following additional requirements shall be applied to control the variability of natural graded 0/8mm aggregates.

- a) the manufacturer shall document and, on request, declare the typical grading for each aggregate produced;

b) gradings shall comply with the tolerances given in Table 7.

**Table 7 — Tolerances on manufacturer's declared typical grading for natural graded 0/8 mm aggregate**

Sieve size mm	Tolerances Percentages passing by mass
8	<b>± 5</b>
2	<b>± 10</b>
1	<b>± 10</b>
0,250	<b>± 10</b>
0,125	<b>± 3</b>
0,063	<b>± 2</b>
<p>a Tolerances of ± 5 are further limited by the requirements for the percentage passing <i>D</i> in Table 2.</p> <p>b In addition to the tolerances stated the maximum value of the fines content for the category selected from Table 8 applies for the percentage passing the 0,063 mm sieve.</p>	

#### 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 8.



**Table 8 — Categories for maximum values of fines content**

Aggregate	0,063 mm sieve (Percentage passing by mass )	Category <i>f</i>
Coarse	≤0,5	<i>f</i> <sub>0,5</sub>
	≤1	<i>f</i> <sub>1</sub>
	≤1,5	<i>f</i> <sub>1,5</sub>
	≤2	<i>f</i> <sub>2</sub>
	≤ 4	<i>f</i> <sub>4</sub>
	> 4	<i>f</i> <sub>Declared</sub>
	<b>No requirement</b>	<i>f</i> <sub>NR</sub>
Natural graded 0/8 mm	≤ 3	<i>f</i> <sub>3</sub>
	≤ 5	<i>f</i> <sub>5</sub>
	≤ 7	<i>f</i> <sub>7</sub>
	≤ 10	<i>f</i> <sub>10</sub>
	≤ 16	<i>f</i> <sub>16</sub>
	> 16	<i>f</i> <sub>Declared</sub>
	<b>No requirement</b>	<i>f</i> <sub>NR</sub>
All-in	≤ 3	<i>f</i> <sub>3</sub>
	≤ 5	<i>f</i> <sub>5</sub>
	≤ 7	<i>f</i> <sub>7</sub>
	≤ 9	<i>f</i> <sub>9</sub>
	≤ 11	<i>f</i> <sub>11</sub>
	≤ 12	<i>f</i> <sub>12</sub>
	≤ 15	<i>f</i> <sub>15</sub>
	> 15	<i>f</i> <sub>Declared</sub>
	<b>No requirement</b>	<i>f</i> <sub>NR</sub>
Fine	≤ 3	<i>f</i> <sub>3</sub>
	≤ 4	<i>f</i> <sub>4</sub>
	≤ 5	<i>f</i> <sub>5</sub>
	≤ 6	<i>F</i> <sub>6</sub>
	≤ 7	<i>f</i> <sub>7</sub>
	≤ 10	<i>f</i> <sub>10</sub>
	≤ 16	<i>f</i> <sub>16</sub>
	≤ 22	<i>f</i> <sub>22</sub>
	> 22	<i>f</i> <sub>Declared</sub>
	<b>No requirement</b>	<i>f</i> <sub>NR</sub>

#### 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* ≤ 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:

- 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 9 is higher than a specified limit.

**Table 9 — Categories for minimum sand equivalent (SE) values**

Sand equivalent	Category (0/2mm)	Category (0/4mm)
	SE10	SE4
≥ 65	SE10 <sub>65</sub> Declared	SE4 <sub>65</sub> Declared
≥ 60	SE10 <sub>60</sub>	SE4 <sub>60</sub>
≥ 55	SE10 <sub>55</sub>	SE4 <sub>55</sub>
≥ 50	SE10 <sub>50</sub>	SE4 <sub>50</sub>
≥ 45	SE10 <sub>45</sub>	SE4 <sub>45</sub>
≥ 40	SE10 <sub>40</sub>	SE4 <sub>40</sub>
≥ 35	SE10 <sub>35</sub>	SE4 <sub>35</sub>
≥ 30	SE10 <sub>30</sub>	SE4 <sub>30</sub>
< 30	SE10 <sub>Declared</sub>	SE4 <sub>Declared</sub>
No requirement	SE10 <sub>NR</sub>	SE4 <sub>NR</sub>

- 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 10 is lower than a specified limit.

Table 10 — Categories for maximum methylene blue (*MB*) values

Aggregate	Methylene blue values	Category <i>MB</i>	
		<i>MB<sub>F</sub></i> 0/0.125	<i>MB</i> 0/2
Fine	<i>MB</i> value g/kg		
	≤ 1	<i>MB<sub>F1</sub></i>	<i>MB<sub>1</sub></i>
	≤ 1,5	<i>MB<sub>F1,5</sub></i>	<i>MB<sub>1,5</sub></i>
	≤ 2	<i>MB<sub>F2</sub></i>	<i>MB<sub>2</sub></i>
	≤ 2,5	<i>MB<sub>F2,5</sub></i>	<i>MB<sub>2,5</sub></i>
	≤ 3	<i>MB<sub>F3</sub></i>	<i>MB<sub>3</sub></i>
	> 3	<i>MB<sub>FDeclared</sub></i>	<i>MB<sub>Declared</sub></i>
	No requirement	<i>MB<sub>FNR</sub></i>	<i>MB<sub>NR</sub></i>
All-in	$MB_{0/D} = MB \times \text{passing the 2 mm sieve}^a$ g/kg		
	≤ 0,8	<i>MB<sub>A0,8</sub></i>	
	≤ 1	<i>MB<sub>A1</sub></i>	
	> 1	<i>MB<sub>ADeclared</sub></i>	
	No requirement	<i>MB<sub>ANR</sub></i>	

<sup>a</sup> *MB<sub>A</sub>* 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 11, according to the particular application or end use.

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

**Table 11 — Categories for maximum values of flakiness index**

<b>Flakiness Index</b>	<b>Category</b> <i>FI</i>
$\leq 10$	<i>FI</i> <sub>10</sub>
$\leq 15$	<i>FI</i> <sub>15</sub>
$\leq 20$	<i>FI</i> <sub>20</sub>
$\leq 25$	<i>FI</i> <sub>25</sub>
$\leq 30$	<i>FI</i> <sub>30</sub>
$\leq 35$	<i>FI</i> <sub>35</sub>
$\leq 40$	<i>FI</i> <sub>40</sub>
$\leq 50$	<i>FI</i> <sub>50</sub>
$> 50$	<i>FI</i> <sub>Declared</sub>
<b>No requirement</b>	<i>FI</i> <sub>NR</sub>

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 12 according to the particular application or end use.

**Table 12 — Categories for maximum values of shape index**

Shape Index	Category <i>SI</i>
≤ 15	<i>SI</i> <sub>15</sub>
≤ 20	<i>SI</i> <sub>20</sub>
≤ 25	<i>SI</i> <sub>25</sub>
≤ 30	<i>SI</i> <sub>30</sub>
≤ 35	<i>SI</i> <sub>35</sub>
≤ 40	<i>SI</i> <sub>40</sub>
≤ 50	<i>SI</i> <sub>50</sub>
≤ 55	<i>SI</i> <sub>55</sub>
> 55	<i>SI</i> <sub>Declared</sub>
No requirement	<i>SI</i> <sub>NR</sub>

#### 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 13.

Aggregates obtained from crushing rock shall be assumed to be category *C*<sub>100/0</sub> and do not require further testing.

**Table 13 — 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 <i>C</i>
90 to 100	100	0	<i>C</i> <sub>100/0</sub>
30 to 100	95 to 100	0 to 1	<i>C</i> <sub>95/1</sub>
30 to 100	90 to 100	0 to 1	<i>C</i> <sub>90/1</sub>
–	90 to 100	0 to 3	<i>C</i> <sub>90/3</sub>
–	70 to 100	0 to 10	<i>C</i> <sub>70/10</sub>
30 to 100	50 to 100	0 to 10	<i>C</i> <sub>50/10</sub>
–	50 to 100	0 to 30	<i>C</i> <sub>50/30</sub>
–	< 50	> 30	<i>C</i> <sub>Declared</sub>
No requirement	No requirement	No requirement	<i>C</i> <sub>NR</sub>

#### 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 14.

**Table 14 — Categories for angularity of fine aggregates**

Flow coefficient	Category $E_{CS}$
$\geq 38$	$E_{CS}38$
$\geq 35$	$E_{CS}35$
$\geq 30$	$E_{CS}30$
$< 30$	$E_{CS}$ Declared
No requirement	$E_{CS}$ NR

#### 4.7 Shell content of coarse and all-in aggregates

When required, the shell content of coarse and all-in aggregates shall be determined in accordance with EN 933-7, and the results declared in accordance with the relevant category specified in Table 15 according to the particular application or end use.

**Table 15 — Category for maximum value of shell content of coarse and all-in aggregates**

Shell content %	Category
	SC
$\leq 10$	$SC_{10}$
$> 10$	$SC_{\text{Declared}}$
No requirement	$SC_{NR}$

## 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 or end use and origin of the aggregate. When required, the aggregates shall be tested as specified in Clause 5 to determine the relevant physical properties.

When the value of a property is required but not defined by specified limits the value should be declared as an  $XX_{\text{Declared}}$  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 aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242.

Categories, notes, comments etc, which are grey shaded, shall not be used in concrete.

## 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 16 according to the particular application or end use.

**Table 16 — Categories for maximum values of Los Angeles coefficient**

Los Angeles coefficient	Category <i>LA</i>
≤ 15	<i>LA</i> <sub>15</sub>
≤ 20	<i>LA</i> <sub>20</sub>
≤ 25	<i>LA</i> <sub>25</sub>
≤ 30	<i>LA</i> <sub>30</sub>
≤ 35	<i>LA</i> <sub>35</sub>
≤ 40	<i>LA</i> <sub>40</sub>
≤ 45	<i>LA</i> <sub>45</sub>
≤ 50	<i>LA</i> <sub>50</sub>
≤ 60	<i>LA</i> <sub>60</sub>
> 60	<i>LA</i> <sub>Declared</sub>
<b>No requirement</b>	<i>LA</i> <sub>NR</sub>

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 17 according to the particular application or end use.

**Table 17 — Categories for maximum values of resistance to impact**

Impact value %	Category SZ
≤ 18	<b>SZ<sub>18</sub></b>
≤ 22	<b>SZ<sub>22</sub></b>
≤ 26	<b>SZ<sub>26</sub></b>
≤ 32	<b>SZ<sub>32</sub></b>
≤ 35	<b>SZ<sub>35</sub></b>
≤ 38	<b>SZ<sub>38</sub></b>
> 38	<b>SZ<sub>Declared</sub></b>
<b>No requirement</b>	<b>SZ<sub>NR</sub></b>

### 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 18 according to the particular application or end use.

**Table 18 — Categories for maximum values of resistance to wear**

Micro-Deval coefficient	Category $M_{DE}$
≤ 10	<b><math>M_{DE10}</math></b>
≤ 15	<b><math>M_{DE15}</math></b>
≤ 20	<b><math>M_{DE20}</math></b>
≤ 25	<b><math>M_{DE25}</math></b>
≤ 30	$M_{DE30}$
≤ 35	<b><math>M_{DE35}</math></b>
≤ 40	$M_{DE40}$
≤ 45	$M_{DE45}$
≤ 50	<b><math>M_{DE50}</math></b>
> 50	<b><math>M_{DEDeclared}</math></b>
<b>No requirement</b>	<b><math>M_{DENR}</math></b>

### 5.4 Particle density and water absorption

#### 5.4.1 Particle density

When required, the particle density shall be determined in accordance with the appropriate clause of EN 1097-6 and the results declared on request stating the means of determination and the calculations used.



#### 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 of the aggregate for surface course (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 19.

**Table 19 — Categories for minimum values of resistance to polishing**

Polished stone value	Category <i>PSV</i>
$\geq 68$ $\geq 62$ $\geq 56$ $\geq 50$ $\geq 44$ Intermediate values and those < 44	$PSV_{68}$ $PSV_{62}$ $PSV_{56}$ $PSV_{50}$ $PSV_{44}$ $PSV_{Declared}$
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 20.

**Table 20 — Categories for maximum values of resistance to surface abrasion**

Aggregate abrasion value	Category <i>AAV</i>
$\leq 10$ $\leq 15$ $\leq 20$ $> 20$	$AAV_{10}$ $AAV_{15}$ $AAV_{20}$ $AAV_{Declared}$
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 21.

**Table 21 —Categories for maximum values of resistance to abrasion from studded tyres**

Nordic abrasion value	Category $A_N$
$\leq 5$ $\leq 7$ $\leq 10$ $\leq 14$ $\leq 19$ $\leq 30$ <b>Intermediate values and those &gt; 30</b>	<b><math>A_N 5</math></b> <b><math>A_N 7</math></b> <b><math>A_N 10</math></b> <b><math>A_N 14</math></b> <b><math>A_N 19</math></b> <b><math>A_N 30</math></b> <b><math>A_N</math> Declared</b>
<b>No requirement</b>	<b><math>A_N</math> NR</b>

## 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  $XX_{\text{Declared}}$  category, e.g. a value of say 1,2 percent 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 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).

NOTE 4 Guidance on the effects of chemical constituents in aggregates, including alkali-silica reactivity and lightweight organic contaminators related to the durability and surface properties of the concrete in which they are incorporated, is given in Annex C.

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, shall not be used in concrete.

### 6.2 Petrographic description

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

### 6.3 Classification of the constituents of coarse 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 22.

**Table 22 — Categories for constituents of coarse recycled aggregates**

<b>Constituent</b>	<b>Content</b> Percentage by mass	<b>Category</b>
<b><i>Rc</i></b>	≥ 90	<b><i>Rc</i><sub>90</sub></b>
	≥ 80	<b><i>Rc</i><sub>80</sub></b>
	≥ 70	<b><i>Rc</i><sub>70</sub></b>
	≥ 50	<b><i>Rc</i><sub>50</sub></b>
	< 50	<b><i>Rc</i><sub>Declared</sub></b>
	<b>No requirement</b>	<b><i>Rc</i><sub>NR</sub></b>
<b><i>Ru</i></b>	≥ 90	<b><i>Ru</i><sub>90</sub></b>
	≥ 70	<b><i>Ru</i><sub>70</sub></b>
	≥ 50	<b><i>Ru</i><sub>50</sub></b>
	< 50	<b><i>Ru</i><sub>Declared</sub></b>
	<b>No requirement</b>	<b><i>Ru</i><sub>NR</sub></b>
<b><i>Rc + Ru</i></b>	≥ 95	<b><i>Rcu</i><sub>95</sub></b>
	≥ 90	<b><i>Rcu</i><sub>90</sub></b>
	≥ 70	<b><i>Rcu</i><sub>70</sub></b>
	≥ 50	<b><i>Rcu</i><sub>50</sub></b>
	< 50	<b><i>Rcu</i><sub>Declared</sub></b>
	<b>No requirement</b>	<b><i>Rcu</i><sub>NR</sub></b>
<b><i>Rc + Ru + Rg</i></b>	≥ 90	<b><i>Rcug</i><sub>90</sub></b>
	≥ 70	<b><i>Rcug</i><sub>70</sub></b>
	≥ 50	<b><i>Rcug</i><sub>80</sub></b>
	< 50	<b><i>Rcug</i><sub>Declared</sub></b>
	<b>No requirement</b>	<b><i>Rcug</i><sub>NR</sub></b>
<b><i>Rb</i></b>	≤ 10	<b><i>Rb</i><sub>10-</sub></b>
	≤ 30	<b><i>Rb</i><sub>30-</sub></b>
	≤ 50	<b><i>Rb</i><sub>50-</sub></b>
	> 50	<b><i>Rb</i><sub>Declared</sub></b>
	<b>No requirement</b>	<b><i>Rb</i><sub>NR</sub></b>
<b><i>Ra</i></b>	≥ 95	<b><i>Rc</i><sub>95</sub></b>
	≥ 80	<b><i>Rc</i><sub>80</sub></b>
	≥ 50	<b><i>Rc</i><sub>50</sub></b>
	≥ 40	<b><i>Rc</i><sub>40</sub></b>
	> 30	<b><i>Rc</i><sub>30</sub></b>

	$\leq 30$	<i>Ra</i> <sub>30-</sub>
	$\leq 20$	<i>Ra</i> <sub>20-</sub>
	$\leq 10$	<b><i>Ra</i></b> <sub>10-</sub>
	$\leq 5$	<b><i>Ra</i></b> <sub>5-</sub>
	$\leq 1$	<b><i>Ra</i></b> <sub>1-</sub>
	No requirement	<i>Ra</i> <sub>NR</sub>
<b><i>Rg</i></b>	$\leq 2$	<i>Rg</i> <sub>2-</sub>
	$\leq 5$	<i>Rg</i> <sub>5-</sub>
	$\leq 25$	<i>Rg</i> <sub>25-</sub>
	No requirement	<i>Rg</i> <sub>NR</sub>
<b><i>X</i></b>	$\leq 1$	<i>X</i> <sub>1-</sub>
<b><i>X + Rg</i></b>	$\leq 0,5$	<b><i>XRg</i></b> <sub>0,5-</sub>
	$\leq 1$	<b><i>XRg</i></b> <sub>1-</sub>
	$\leq 2$	<b><i>XRg</i></b> <sub>2-</sub>
	No Requirement	<b><i>XRg</i></b> <sub>NR</sub>
<b><i>FL</i></b>	Content cm <sup>3</sup> /kg	
	$\leq 0,2$ <sup>a</sup>	<b><i>FL</i></b> <sub>0,2-</sub>
	$\leq 2$	<b><i>FL</i></b> <sub>2-</sub>
	$\leq 5$	<b><i>FL</i></b> <sub>5-</sub>
	$\leq 10$	<b><i>FL</i></b> <sub>10-</sub>
	No Requirement	<b><i>FL</i></b> <sub>NR-</sub>

<sup>a</sup> The  $\leq 0,2$  category is intended only for special applications requiring high quality surface finish.

where, according to EN 933-11:

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

## 6.4 Sulfur containing compounds

### 6.4.1 Acid-soluble sulfate

When required, the acid-soluble sulfate content of the aggregates and filler for concrete shall be determined in accordance with EN 1744-1 and the results declared in accordance with the relevant category specified in Table 23.

**Table 23 — Categories for maximum values of acid-soluble sulfate content**

<b>Aggregate</b>	<b>Acid soluble sulfate content</b> Percentage by mass	<b>Category</b> AS
<b>Aggregates other than air-cooled blast furnace slag</b>	$\leq 0,2$	<b>AS<sub>0,2</sub></b>
	$\leq 0,8$	<b>AS<sub>0,8</sub></b>
	$> 0,8$	<b>AS<sub>Declared</sub></b>
	<b>No requirement</b>	<b>AS<sub>NR</sub></b>
<b>Air-cooled blast furnace slag</b>	$\leq 1,0$	<b>AS<sub>1,0</sub></b>
	$> 1,0$	<b>AS<sub>Declared</sub></b>
	<b>No requirement</b>	<b>AS<sub>NR</sub></b>

### 6.4.2 Total sulfur

When required, the total sulfur content of aggregates and filler shall be determined in accordance with EN 1744-1 and the results declared in accordance with the relevant category specified in Table 24.

**Table 24 — Categories for maximum values of total sulfur content**

<b>Aggregate</b>	<b>Total sulfur content</b> %	<b>Category</b> <b>S</b>
<b>Aggregates other than air-cooled blast furnace slag</b>	$\leq 1$	<b>S<sub>1</sub></b>
	$> 1$	<b>S<sub>Declared</sub></b>
	<b>No requirement</b>	<b>S<sub>NR</sub></b>
<b>Air-cooled blast furnace slag</b>	$\leq 2$	<b>S<sub>2</sub></b>
	$> 2$	<b>S<sub>Declared</sub></b>
	<b>No requirement</b>	<b>S<sub>NR</sub></b>

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 0,1 % 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 25.

**Table 25 — Categories for maximum values of water-soluble sulfate content of recycled aggregates**

<b>Water-soluble sulfate content</b> Percentage by mass	<b>Category</b> <b>SS</b>
$\leq 0,2$	<b>SS<sub>0,2</sub></b>
$\leq 0,7$	<b>SS<sub>0,7</sub></b>
$\leq 1,3$	<b>SS<sub>1,3</sub></b>
<b>No requirement</b>	<b>SS<sub>NR</sub></b>

#### **6.5 Chlorides**

The water-soluble chloride ion content of aggregates and filler for concrete shall be determined in accordance with EN 1744-1, and the results declared.

**NOTE** If the water-soluble chloride ion content of the combined aggregates is known to be 0,01 % or lower (e.g. for aggregates extracted from most inland quarries) this value can be used in the calculation of the chloride content of concrete.

The acid-soluble chloride ion content of recycled aggregates for concrete shall be determined in accordance with EN 1744-5, and the results declared.

#### **6.6 Carbonate content for concrete pavement surface courses of fine, and all-in aggregates**

When it is required to control the carbonate content in fine aggregates for use in concrete surface courses, the carbonate content shall be determined as specified in EN 196-2, with the test portion being prepared in accordance with EN 1744-1 and the results declared.

## 6.7 Other constituents

### 6.7.1 Constituents which alter the rate of setting and hardening of concrete

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 should be considered to be free from organic matter.

**NOTE** Some inorganic compounds which discolour the supernatant liquid in the sodium hydroxide test do not adversely affect the setting and hardening of concrete.

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

Fine aggregates and filler aggregates that contain organic or other substances in proportions that alter the rate of setting and hardening of concrete, 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, the presence of lightweight organic contaminators shall be tested in accordance with EN 1744-1 and the results declared.

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, shall conform to the requirements of Table 26.

**Table 26 — Categories for influence of water-soluble materials from recycled aggregates on the initial setting time of cement paste**

Change in initial setting time, A min	Category
$\leq 10$	<b>A10</b>
$\leq 40$	<b>A40</b>
$> 40$	<b>A<sub>Declared</sub></b>
<b>No requirement</b>	<b>A<sub>NR</sub></b>

Two screening tests for the presence of organic matter are in common use: the sodium hydroxide test and the fulvo acid test (see EN 1744-1). Both tests may be applied to recycled aggregates. If the supernatant liquid in these tests is lighter than the standard colours the aggregates may be considered to be free from organic matter.

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.

Constituents of recycled aggregates that may adversely affect the rate of setting and hardening of concrete 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.

## **6.7.2 Constituents which affect the volume stability of air-cooled blast furnace slag**

### **6.7.2.1 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.

### **6.7.2.2 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.

## **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 aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242.

Categories, notes, comments etc, which are grey shaded, shall not be used in concrete.

### **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 27.



**Table 27 — Categories for maximum magnesium sulfate soundness**

<b>Magnesium sulfate value</b>	<b>Category</b>
Percentage loss of mass	<i>MS</i>
$\leq 18$	<i>MS<sub>18</sub></i>
$\leq 25$	<i>MS<sub>25</sub></i>
$\leq 35$	<i>MS<sub>35</sub></i>
$> 35$	<i>MS<sub>Declared</sub></i>
<b>No requirement</b>	<i>MS<sub>NR</sub></i>
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, is not greater than the value selected as one of the categories specified in Table 28, 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 28 — Categories for maximum values of water absorption  
(EN 1097- 6 water absorption at 24 h)**

<b>Water absorption</b> Percentage by mass	<b>Category</b>
$\leq 1$	<b><i>WA<sub>24</sub>1</i></b>
$\leq 2$	<b><i>WA<sub>24</sub>2</i></b>
NOTE The water absorption test is not applicable to 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 29.

**Table 29 — Categories for maximum freeze-thaw resistance values**

<b>Freeze-thaw</b> Percentage loss of mass	<b>Category</b>
$\leq 1$	<b><i>F<sub>1</sub></i></b>
$\leq 2$	<b><i>F<sub>2</sub></i></b>
$\leq 4$	<b><i>F<sub>4</sub></i></b>
$> 4$	<b><i>F<sub>Declared</sub></i></b>
<b>No requirement</b>	<b><i>F<sub>NR</sub></i></b>

### 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 in the presence of salt shall be determined in accordance with EN 1367-6 and the results shall be declared in accordance with the relevant category specified in Table 30. In this case the resistance to freezing and thawing (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 30 — Categories for maximum freeze-thaw resistance in the presence of salt**

Freeze-thaw Percentage loss of mass	Category $F_{EC}$
$\leq 2$	$F_{EC2}$
$\leq 4$	$F_{EC4}$
$\leq 5$	$F_{EC5}$
$\leq 6$	$F_{EC6}$
$\leq 8$	$F_{EC8}$
$\leq 14$	$F_{EC14}$
$\leq 25$	$F_{EC25}$
$\leq 50$	$F_{EC50}$
$> 50$	$F_{EC-Declared}$
<b>No requirement</b>	$F_{EC.NR}$

NOTE When tested using de-icing solutions other than NaCl, the limits of Table 30 would not apply.

#### 7.4 Volume stability - drying shrinkage

Where disruptive shrinkage cracking of concrete might occur due to the properties of the aggregates, the drying shrinkage associated with aggregates to be used in structural concrete shall, when required, not exceed 0,075 % when tested in accordance with EN 1367-4 and the results declared.

NOTE 1 This requirement does not apply to positions where drying out never occurs, mass concrete surfaced with air entrained concrete, or to structural elements symmetrically and heavily reinforced and not exposed to the weather.

NOTE 2 Volume stability - expansion. In very rare circumstances, it is possible that recycled aggregate can contain expansive material such as un-slaked lime. Currently it is not possible to give requirements as no test methods are available.

#### 7.5 Alkali-silica reactivity

When required the alkali-silica reactivity of aggregates shall be assessed in accordance with the provisions valid in the place of use.

NOTE Guidance on the effects of alkali-silica reactivity is given in Annex C.

### 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 as described in Annex A – specific material;
- c) for recycled aggregates, the constituent categorisation according to Table 22;
- 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.1a and Table ZA.1b.

## **10 Marking and labelling**

The delivery ticket shall contain at least the following information:

- a) source and manufacturer;
- b) designation;
- c) date of dispatch;
- d) serial number of the ticket;
- e) 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 12620 and their status in respect of the scope of the 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 12620.

Sources with no history of use in concrete 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 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 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 12620 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	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 <sup>a</sup> (excluding fly ash) (MIBA)	Yes	No	Yes
		B2	Municipal incinerator fly ash (MIFA)	No	-	-
C	Coal Power generation industry	C1	Coal fly ash	Yes	Yes	No
		C2	Fluidized bed combustion fly ash (FBCFA)	No	-	-
		C3	Boiler slag	Yes	No	No
		C4	Coal bottom ash	No	-	-
		C5	Fluidized bed combustion bottom ash (FBC bottom ash)	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	-	-
		D6	Ferrochromium Slag	No	-	-
E	Non ferrous metal industry	E1	Copper slag	Yes	No	Yes
		E2	Ferromolybdenum slag	No	-	-
		E3	Zinc slag	Yes	No	Yes
		E4	Phosphorus slag	No	-	-

Nr.	Source	Subnr.	Specific material	History of use	Special requirements in standard	Additional requirements identified for inclusion
F	Foundry industry	F1	Foundry sand	Yes	No	Yes
		F2	Foundry cupola furnace slag	No	-	-
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	Yes	No	Yes
		H2	Dredge spoil clay	No	-	-
I	Miscellaneous	I1	Excavated soil	No	-	-
		I2	Paper sludge ash	Yes	No	Yes
		I3	Sewage sludge incineration ash (municipal)	No	-	-
		I4	Biomass ash	No	-	-
		I5	Crushed glass	Yes	Yes	Yes
		I6	Expanded Clay	See prEN 13055	-	-
<sup>a</sup> Requirements on MIBA are based on experience with grated installations.						

## Annex B (informative)

### Guidance on the description of coarseness/fineness of fine aggregates

Tables B.1 and B.2 are provided where specifiers wish to additionally describe the coarseness or fineness of fine aggregates. Either of the tables, but not both, can be used for such descriptions.

In Tables B.1 and B.2, coarse graded fine aggregates are denoted by the letter *C*, medium grading by *M* and fine grading by *F*.

Additionally, when Table B.1 is selected, a *P* for percentage passing the 0,500 mm sieve is added after *C*, *M* or *F* (e.g. for medium grading *MP*).

Similarly when Table B.2 is selected an *F* for fineness modulus is added after *C*, *M* or *F* (e.g. for fine grading *FF*).

**Table B.1 — Coarseness or fineness based on the percentage passing the 0,500 mm sieve**

Percentage passing by mass		
<i>CP</i>	<i>MP</i>	<i>FP</i>
5 to 45	30 to 70	55 to 100

**Table B.2 — Coarseness or fineness based on the fineness modulus**

Fineness modulus		
<i>CF</i>	<i>MF</i>	<i>FF</i>
4,0 to 2,4	2,8 to 1,5	2,1 to 0,6

Fineness modulus (*FM*) is used to check constancy. Where additionally required the *FM* of a delivery should be within the limits of the declared  $FM \pm 0,50$  or other specified limit.

NOTE Fineness modulus (*FM*) is normally calculated as the sum of cumulative percentages by mass retained on the following sieves (mm) expressed as a percentage, i.e.:

$$FM = \frac{\Sigma \{(> 4) + (> 2) + (> 1) + (> 0,5) + (> 0,25) + (> 0,125)\}}{100}$$



## **Annex C** (informative)

### **Guidance on the effects of some chemical constituents of aggregates on the durability of concrete in which they are incorporated**

#### **C.1 Chlorides**

##### **C.1.1 Chlorides in natural aggregates**

Chlorides can be present in aggregates usually as sodium and potassium salts, the quantity present being largely dependent on the source of the aggregate. Such salts contribute to the total chloride and alkali content of the concrete. To minimize the risk of corrosion of embedded metal it is usual to limit the total quantity of chloride ion contributed by all the constituent materials in the concrete.

The water-soluble chloride ion content of aggregates extracted from most inland deposits is likely to be very low. Where it can be shown that the chloride content of such materials is not greater than 0,01 % this value can be used in the calculation procedure based on the maximum chloride contents of the constituent materials in the concrete.

##### **C.1.2 Chlorides in recycled aggregates**

For recycled aggregates, particularly those containing hardened concrete or mortar, chlorides may be combined in the calcium aluminate and other phases. The combined chlorides are unlikely to be extracted using water in the procedures described in Clause 7 of EN 1744-1:2009 even if the sample is ground to a fine powder before extraction.

For most recycled aggregates, chloride ion contents are likely to be low. The acid-soluble chloride content, determined in accordance with EN 1744-5, will probably overestimate the availability of chlorides and this value should be used in the calculation of the chloride ion content of the concrete. This may provide an additional margin of safety.

#### **C.2 Sulfates**

Sulfates in aggregates can give rise to expansive disruption of the concrete. A substantial proportion of the sulfate in crystalline blast-furnace slag is encapsulated in the slag grains and therefore plays no part in the hydration reactions of cement. For this reason a higher proportion of sulfate is tolerable in slag. Under certain circumstances other sulfur compounds present in the aggregates can oxidize in the concrete to produce sulfates. These can also give rise to expansive disruption of concrete.

Water-soluble sulfates in recycled aggregates determined in accordance with EN 1744-1 are essentially potentially reactive sulfates (e.g. gypsum plaster) and may also give rise to expansive disruption of concrete.

## C.3 Alkali-silica reaction

### C.3.1 Alkali-silica reaction with natural aggregates

Certain aggregates can react with alkaline hydroxides present in the pore fluids of concrete. Under adverse conditions and in the presence of moisture this can lead to expansion and subsequent cracking or disruption of the concrete. The most common form of reaction occurs between alkalis and certain forms of silica (alkali-silica reaction). Another less common form of reaction is alkali-carbonate reaction.

In the absence of previous long-term experience of a lack of disruptive reactivity of a particular combination of cement and aggregate, it can be necessary to take at least one of the following precautions:

- limit the total alkali content of the concrete mix;
- use a cement with a low effective alkali content;
- use a non-reactive aggregate combination;
- limit the degree of saturation of the concrete with water.

The combination of aggregates and cement can be assessed using Regulations applying at the place of use when compliance with one of the above procedures is not possible.

Where aggregates are imported across national boundaries, the purchaser should take account of experience in the country of origin.

### C.3.2 Alkali-silica reaction with recycled aggregates (including manufactured glass)

The use of recycled aggregates can influence the suitability of the above precautions. In the case of recycled concrete aggregates, it will be necessary to ascertain that the original concrete does not contain reactive (or reacting) aggregate and, where the alkali content of the new concrete (or the cement therein) is being limited, the alkali content of the recycled concrete aggregates will need to be determined and taken into account. In the case of general recycled aggregates, it will be appropriate to regard the material as being a potentially reactive aggregate, unless it has been specifically established to be non-reactive. In both cases, the possibility of unpredictable compositional variability should be considered.

## C.4 Constituents affecting the surface finish of concrete

Where appearance is an essential feature of concrete, aggregates should not contain materials in proportions that adversely affect surface quality or durability.

Since very small percentages by mass of contaminators in aggregates can have a considerable effect on concrete finishes, attention should be given to the suitability of a source for a particular end use.

The proportion of lightweight organic contaminators, determined in accordance with EN 1744-1, should not normally exceed:

- a) 0,5 % by mass of fine aggregate; or
- b) 0,1 % by mass of coarse aggregate.

Where the surface of concrete is of importance, the proportion of lightweight organic contaminators, determined in accordance with EN 1744-1, should not normally exceed:

- c) 0,25 % by mass of fine aggregate; or
- d) 0,05 % by mass of coarse aggregate.

In some situations, for example critical fair faced concrete, it can be necessary to make additional agreements on levels of lightweight organic contaminators.

Some constituents of aggregates can adversely affect the surface finish of concrete causing staining, discoloration, swelling or pop-outs if present close to the surface of the concrete. Reactive iron sulfide and lignite are two examples of materials that can affect concrete in this way.

### **C.5 Constituents affecting the setting and hardening of concrete**

Other constituents of aggregates can adversely affect the rate of hydration of cement altering the rate of setting and hardening of concrete. Humus and sugar-type materials are two examples of substances that have such an effect. Some clay minerals also adversely affect the rate of development of strength, the strength and the durability of concrete in which they are incorporated.

Constituents of recycled aggregates that can adversely affect the rate of setting and hardening of concrete can be inorganic, and therefore not detected by the procedures given in 15.3 of EN 1744-1:2009. The procedures given in EN 1744-6 should be used for recycled aggregates.

### **C.6 Constituents of air-cooled blastfurnace slag**

Some constituents of air-cooled blastfurnace slag can adversely affect its volume stability when used as aggregates for concrete. However, air-cooled blastfurnace slag from modern production units is less likely to be unsound in this way.

## 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 Directive, not affecting the fitness for intended uses, can be applicable to the aggregates and fillers falling within the scope of this 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://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm>).

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**

<b>Product:</b> Aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates as covered by the scope of this standard			
<b>Intended use(s):</b> Preparation of concrete for use in buildings, roads and other civil engineering works			
<b>Essential Characteristics</b>	<b>Requirement clauses in this and/or another standard(s)</b>	<b>Level(s) and/or class(es):</b>	<b>Notes</b>
Particle shape, size and density	4.2 Aggregate size	None	Designation ( <i>d/D</i> )
	4.3 Grading	None	Tolerance category
	4.6 Particle shape of coarse and all-in aggregate	None	Category
	5.4.1 Particle density	None	Declared value
Cleanliness	4.4 Fines content	None	Category
	4.5 Fines quality	None	Category
	4.7 Shell content of coarse and all-in aggregate	None	Category
Resistance to fragmentation/crushing	5.2 Resistance to fragmentation	None	Category
Resistance to polishing/abrasion/wear/attrition	5.3 Resistance to wear	None	Category
	5.6 Resistance to polishing for surface courses	None	Category
	5.7 Resistance to surface abrasion	None	Category
Composition/content	6.2 Petrographic description	None	Declared values
	6.3 Classification of the constituents of coarse recycled aggregates	None	Category
	6.4.5 Chlorides	None	Declared value
	6.4.1 Acid soluble sulfates	None	Category
	6.4.2 Total sulfur	None	Category
	6.4.3 Water soluble sulfate content of recycled aggregates	None	Category
	6.7.1 Constituents which alter the rate of setting and hardening of concrete	None	Pass/failed Category
6.6 Carbonate content of fine and all-in aggregates for concrete pavement surface courses	None	Declared value	
	6.7.1 Influence on initial setting time of cement (recycled aggregates)	None	Category
Volume stability	7.4 Volume stability - drying shrinkage	None	Pass/fail threshold value
	6.7.2 Constituents which affect the volume stability of air-cooled blastfurnace slag	None	Pass/fail threshold value

<b>Product:</b> Aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates as covered by the scope of this standard			
<b>Intended use(s):</b> Preparation of concrete for use in buildings, roads and other civil engineering works			
<b>Essential Characteristics</b>	<b>Requirement clauses in this and/or another standard(s)</b>	<b>Level(s) and/or class(es):</b>	<b>Notes</b>
Water absorption	5.4.2 Water absorption	None	Declared value
Dangerous substances: Emission of radioactivity (for aggregates from radioactive sources intended for use in concrete in buildings) Release of heavy metals Release of polyaromatic hydrocarbons 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	<u>See</u> third paragraph of ZA.3
Durability Freeze-thaw resistance	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
Durability against studded tyres	5.8 Resistance to abrasion from studded tyres to be used for surface course	None	Category
Durability against alkali-silica reactivity	7.5 Alkali-silica reactivity	None	provisions valid in the place of use

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

<b>Product:</b> Fillers obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates			
<b>Intended use(s):</b> Preparation of concrete for use in buildings, roads and other civil engineering works			
<b>Essential Characteristics</b>	<b>Requirement clauses in this and/or another standard(s)</b>	<b>Level(s) and/or class(es):</b>	<b>Notes</b>
Fineness/particle size and density	4.3.5 Grading for filler	None	Pass/fail threshold value
	5.4 Particle density and water absorption	None	Declared value
Composition/content	6.5 Chlorides	None	Declared value
	6.4.1 Acid soluble sulfate	None	Categories
	6.4.2 Total sulfur	None	Categories
	6.7.1 Constituents which alter the rate of setting and hardening of concrete	None	Pass/fail Category
Cleanliness	4.4 Fines Content	None	Category
Volume stability	7.4 Volume stability - drying shrinkage	None	Pass/fail threshold value
	6.7.2 Constituents which affect the volume stability of air-cooled blastfurnace slag	None	Declared value
Release of 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		Third paragraph of ZA.3
Durability against freeze-thaw	7.3 Resistance to freezing and /thawing	None	Categories

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 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 level.

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

### **ZA.2.1 System(s) 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 M125 "Aggregates", as amended, is shown in Tables ZA.2a and Table 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<sup>1)</sup> (where third party intervention is required)**

<b>Product(s)</b>	<b>Intended use(s)</b>	<b>Level(s) or class(es)</b>	<b>Attestation of conformity system(s)</b>
Aggregates for concrete, mortar and grout	In buildings, roads and other civil engineering works	-	2+
Fillers for concrete, mortar and grout	In buildings, 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<sup>1)</sup> (where no third party intervention is required)**

<b>Product(s)</b>	<b>Intended use(s)</b>	<b>Level(s) or class(es)</b>	<b>Attestation of conformity system(s)</b>
Aggregates for concrete, mortar and grout	In buildings, roads and other civil engineering works	-	4
Fillers for concrete mortar and grout	In buildings, 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.

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



**Table ZA.3 a) — Assignment 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	Clauses 9 and 5 of EN 16236:2013
	Initial type testing by the manufacturer	All relevant characteristics of Table ZA.1a or Table ZA.1b	Clauses 9 and 4 of EN 16236:2013
Tasks under the responsibility of the notified body	Certification of the conformity of the product F.P.C on the basis of	Initial inspection of factory and of F.P.C	Clauses 9 and 5 of EN 16236:2013
		Continuous surveillance, assessment and approval of F.P.C.	Clauses 9 and 5 of EN 16236:2013

**Table ZA.3 b) — Assignment 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	Clauses 9 and 5 of EN 16236:2013
	Initial type testing	All relevant characteristics of Table ZA.1a or Table ZA.1b	Clauses 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 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:

- a) 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.

- b) 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.

- c) 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);
- d) particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);
- e) the number of the accompanying factory production control certificate, and FPC records, where applicable;
- f) 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 certificates 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 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 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 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:

- a) identification number of the notification body (in case of products following Table ZA.3 a));
- b) name or identifying mark and registered address of the manufacturer;
- c) the last two digits of the year in which the marking is affixed;
- d) the number of the certificate of factory production control (in case of products following Table ZA.3a));
- e) reference to this European Standard with date of version (EN 12620:2013);
- f) description of the product: generic name, material, dimensions, and intended use;
- g) information on the relevant essential characteristics in Tables ZA.1a or ZA.1b namely:
  - 1) values and, where relevant, the class to declare for each relevant characteristic;
  - 2) 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.



01234

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0123-CPD-0456

**EN 12620:2013**  
**Aggregates for concrete**

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

N° of European Standard with date of version

Description of product and

information on product and on regulated characteristics

<b>Particle shape</b>	Category	(F1)
	Designation	(d/D)
<b>Particle size</b>	Tolerance Category	(eg G <sub>20/15</sub> )
<b>Particle density</b>	Declared value	(Mg/m <sup>3</sup> )
<b>Cleanliness</b>		
Fines content	Category	(e.g.f4)
Fines quality	Category	(MB, SE)
Shell content	Category	(e.g. SC <sub>10</sub> )
<b>Resistance to fragmentation/crushing</b>	Category	(e.g.LA <sub>15</sub> )
<b>Resistance to polishing</b>	Category	(e.g.PSV <sub>56</sub> )
<b>Resistance to abrasion</b>	Category	(e.g.AAV <sub>10</sub> , A <sub>N</sub> 30)
<b>Resistance to wear</b>	Category	(e.g.M <sub>DE</sub> 20)
<b>Composition/content</b>		
Composition of coarse recycled aggregate	Categories	(e.g.Rc <sub>90</sub> , XRG <sub>0,5</sub> , Rcu <sub>95</sub> , R <sub>a1</sub> , FL <sub>0,2</sub> .)
Chlorides	Declared value	(% Cl)
Acid soluble sulfates	Category	(e.g. AS <sub>0,2</sub> )
Total sulfur	Category	(e.g. S <sub>NR</sub> )
Water soluble sulfate content of recycled aggregate	Category	(e.g.SS <sub>0,2</sub> )
Constituents which alter the rate of setting and hardening of concrete	Pass/fail threshold value	(Stiffening time in minutes and compressive strength S%)
Influence of recycled aggregates on initial setting time of cement	Category	(e.g.A <sub>25</sub> )
Carbonate content	Declared value	(% CO <sub>2</sub> )
<b>Volume stability</b>		
Drying shrinkage	Pass/fail Declared value	(% WS)
Constituents which affect the the volume stability of air-cooled blastfurnace slag	Declared value	(Appearance)
<b>Water absorption</b>	Declared value	(% WA <sub>24</sub> )

<b>Emission of radioactivity</b> <b>Release of heavy metals</b> <b>Release of polyaromatic hydrocarbons</b>	} Threshold values valid in the place of use
<b>Release of dangerous substances</b>	
<b>Durability against freeze-thaw</b>	<i>Category</i> (F or MS)

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



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**EN 12620:2013  
Aggregates for concrete**

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

N° of European Standard with date of version

Description of product and

information on product and on regulated characteristics

<b>Particle shape</b>	Category	(FI)
<b>Particle size</b>	Designation	(d/D)
	Tolerance Category	(eg G <sub>20/15</sub> )
<b>Particle density</b>	Declared	(Mg/m <sup>3</sup> )
<b>Cleanliness</b>	Fines content	Category (e.g.f4)
	Fines quality	Category (MB, SE)
	Shell content	Category (e.g. SC <sub>10</sub> )
<b>Resistance to fragmentation/crushing</b>	Category	(e.g.LA <sub>15</sub> )
<b>Resistance to polishing</b>	Category	(e.g.PSV <sub>56</sub> )
<b>Resistance to abrasion</b>	Category	(e.g.AAV <sub>10</sub> , A <sub>N</sub> 30)
<b>Resistance to wear</b>	Category	(e.g.M <sub>DE</sub> 20)
<b>Composition/content</b>		
Composition of coarse recycled aggregate	Category (e.g. Rc <sub>90</sub> , XRG <sub>0,5</sub> , RCU <sub>95</sub> , Ra <sub>1</sub> , FL <sub>0,2</sub> .)	
Chlorides	Declared value	(% Cl)
Acid soluble sulfates	Category	(e.g. AS <sub>0,2</sub> )
Total sulfur	Category	(e.g. S <sub>NR</sub> )
Water soluble sulfate content of recycled aggregate	Category	(e.g. SS <sub>0,2</sub> )
Constituents which alter the rate of setting and hardening of concrete	Pass/fail threshold value	(Stiffening time in minutes and compressive strength S%)
Influence of recycled aggregates on initial setting time of cement	Category	(e.g.A <sub>25</sub> )
Carbonate content	Declared value	(%CO <sub>2</sub> )
<b>Volume stability</b>		
Drying shrinkage	Declared value	(% WS)
Constituents which affect the the volume stability of air-cooled blastfurnace slag	Declared value	(Appearance)
<b>Water absorption</b>	Declared value	(% WA <sub>24</sub> )

<b>Emission of radioactivity</b> <b>Release of heavy metals</b> <b>Release of polyaromatic carbons</b>	} Threshold values valid in the place of use
<b>Release of other dangerous substances</b> <b>Durability against freeze-thaw</b>	
	Declared value (F or MS)

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


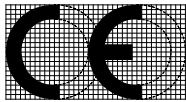
 01234		CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.
Any Co Ltd, PO Box 21, B-1050  13  0123-CPD-0456		Identification number of the inspection body  Name or identifying mark and registered address of the manufacturer  Last two digits of the year in which the marking was affixed
EN 12620:2013  Filler Aggregates for concrete		Number of the EC certificate  N° of European Standard with date of version  Description of product and information on regulated characteristics
<b>Fineness/Particle size</b>	Declared value	(% passing by mass and cm <sup>2</sup> /g)
<b>Particle density</b>	Declared value	(Mg/m <sup>3</sup> )
<b>Composition/content</b>		
Chlorides	Declared value	(% Cl)
Acid soluble sulfates	Categories	(e.g. AS <sub>0.2</sub> )
Total sulfur	Pass/fail threshold value	(% S)
<b>Cleanliness</b>	Pass/fail threshold values	(% passing, % by mass, MB <sub>F</sub> , SE)
<b>Volume stability</b>		
Drying shrinkage	Pass/fail threshold value	(% drying shrinkage)
Constituents which affect the volume stability of air-cooled blastfurnace slag	Declared value	(visual appearance, visual cracking or disintegration)
<b>Release of other dangerous substances</b>		

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



			<p><i>CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.</i></p>
<p><b>Any Co Ltd, PO Box 21, B-1050</b></p> <p><b>13</b></p>			<p><i>Name or identifying mark and registered address of the manufacturer</i></p> <p><i>Last two digits of the year in which the marking was affixed</i></p>
<p><b>EN 12620:2013</b></p> <p><b>Filler Aggregates for concrete</b></p>			<p><i>N° of European Standard with date of version</i></p> <p><i>Description of product and information on regulated characteristics</i></p>
<b>Fineness/Particle size</b>	Declared values	(% passing and cm <sup>2</sup> /g)	
<b>Particle density</b>	Declared value	(Mg/m <sup>3</sup> )	
<b>Composition/content</b>	Declared value	(% Cl)	
Chlorides	Category	(e.g. AS <sub>0,2</sub> )	
Acid soluble sulfates	Declared Value	(% S)	
Total sulfur			
<b>Cleanliness</b>	Category	(MB, SE)	
<b>Volume stability</b>			
Drying shrinkage	Pass/fail threshold value	(% drying shrinkage)	
Constituents which affect the volume stability of air-cooled blastfurnace slag	Declared value	(visual appearance, visual cracking or disintegration)	
<b>Release of dangerous substances</b>			

**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.

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