



**SLOVENSKI STANDARD**  
**oSIST prEN 13242:2015**  
**01-julij-2015**

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**Agregati za nevezane in hidravlično vezane materiale za uporabo v inženirskih objektih in za gradnjo cest**

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

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

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

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

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

Gesteinskörnungen für ungebundene und hydraulische gebundene Baustoffe für Ingenieur- und Straßenbau

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 154.

If this draft becomes a European Standard, 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.

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

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## Foreword

This document (prEN 13242:2015) has been prepared by Technical Committee CEN/TC 154 “Aggregates”, the secretariat of which is held by BSI.

This document is currently submitted to CEN Enquiry

This document supersedes EN 13242:2002+A1:2007.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Construction Products Regulation (EU) No. 305/2011.

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

The most significant technical changes compared to the previous edition include:

- a) Harmonisation of vocabulary and Annex ZA to be consistent with Construction Products Regulation;
- b) Unification of categories which are common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242;
- c) Description of assessment and verification of conformity of performance of aggregates (AVCP) - type testing and factory production control in a separate new standard EN 16236;
- d) Implementing general sentences on dangerous substances and adding a new normative Annex A dealing with all source materials considered;
- e) Unification of definitions which are common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242, i. e. for coarse, fine, all-in aggregates and natural graded 0/8 aggregates;
- f) Adding categories for the sand equivalent value for fines quality;
- g) Adding categories for the methylene blue value for fines quality;
- h) Adding characteristics for maximum Micro-Deval, angularity and water suction height.

In this document the wordings ‘property’ and ‘characteristic’ have the same meaning.

Requirements for assessment and verification of constancy of performance are given in prEN 16236.

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

- EN 12620, *Aggregates for concrete*;
- EN 13043, *Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas*;
- EN 13055, *Lightweight aggregates*;
- EN 13139, *Aggregates for mortar*;
- EN 13383-1, *Armourstone — Part 1: Specification*;
- EN 13450, *Aggregates for railway ballast*.

## 1 Scope

This European Standard specifies the properties of aggregates and filler aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates for use in hydraulically bound and unbound materials for civil engineering works and road constructions.

It covers aggregates having an oven dried particle density greater than 2,00 Mg/m<sup>3</sup>. It also covers recycled coarse and all-in aggregates with particle densities greater than 1,50 Mg/m<sup>3</sup> with appropriate caveats and recycled fine aggregate with appropriate caveats (see Annex A).

NOTE 1 Requirements for lightweight aggregates are specified in EN 13055.

Use of aggregates as soil is not covered by the present standard.

NOTE 2 Due to huge variation of geological and pedological conditions in Europe, precise definition of soil can be found in the documents related to the application in the place of use.

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 Assessment and Verification of the Constancy of Performance (AVCP) of aggregates to this European Standard are given in prEN 16236.

Aggregates used in construction shall conform to all the requirements of the relevant European Standards for aggregates. 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 constituents of recycled aggregates.

NOTE 3 Requirements for unbound mixtures for road constructions are specified in EN 13285 and are not therefore covered in this standard. EN 13285 does however call up the general requirements of EN 13242 for the aggregates.

## 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, *Method of testing cement - Part 2: Chemical analysis of cement*

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

EN 933-1, *Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method*

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

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

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

EN 933-6, *Tests for geometrical properties of aggregates - Part 6: Assessment of surface characteristics - Flow coefficient of aggregates*

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- 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 933-11, *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: 2013, *Tests for mechanical and physical properties of aggregates - Part 6: Determination of particle density and water absorption*
- EN 1097-10, *Tests for mechanical and physical properties of aggregates - Part 10: Determination of water suction height*
- EN 1367-1, *Tests for thermal and weathering properties of aggregates - Part 1: Determination of resistance to freezing and thawing*
- EN 1367-2, *Tests for thermal and weathering properties of aggregates - Part 2: Magnesium sulfate test*
- EN 1367-3, *Tests for thermal and weathering properties of aggregates - Part 3 : Boiling test for "Sonnenbrand basalt"*
- EN 1367-6, *Tests for thermal and weathering properties of aggregates - Part 6: Determination of resistance to freezing and thawing in the presence of salt (NaCl)*
- EN 1744-1, *Tests for chemical properties of aggregates — Part 1: Chemical analysis*
- EN 1744-6, *Tests for chemical properties of aggregates - Part 6: Determination of the influence of recycled aggregate extract on the initial setting time of cement*
- prEN 16236, *Assessment and Verification of the Constancy of Performance (AVCP) of aggregates —Type Testing and Factory Production Control*
- ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

**3.1****aggregate**

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

**3.2****natural aggregate**

aggregate from mineral sources that has been subjected to nothing more than mechanical processing



**3.3****manufactured aggregate**

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

**3.4****recycled aggregate**

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

**3.5****level**

result of the assessment of the performance of an aggregate in relation to its essential characteristics, expressed as a numerical value

EXAMPLE  $WA_{24 \text{ Declared}} = 0,5 \%$

**3.6****class**

range of levels, delimited by a minimum and a maximum value, of performance of an aggregate

EXAMPLE  $G_c 85/15$

**3.7****category**

level or class of a property of an aggregate expressed as a range of values (class) or a limiting value (level for individual value or declared category)

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

EXAMPLES  $F1 50, f_{\text{Declared}} 25$  (Declared category)

**3.8****declared value**

level of a property declared by the manufacturer

EXAMPLE  $\rho_{\text{rd Declared}} 1,5$  (Declared value)

**3.9****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).

**3.10****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  $G_n X/Y$  in which:

n: type of grading defined below:

C = coarse;

CA = coarse for aggregates for bituminous mixtures only;

G = grit ( $D = 4$  and  $d \geq 1$ );

F = fine;

NG = natural graded;

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A = all-in

X: lower limit passing D

Y: upper limit passing d

**3.11****finer**

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

**3.12****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 grit – see 3.10) are treated as coarse aggregate.

**3.13****fine aggregate**

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

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

**3.14****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.

**3.15****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.

**3.16****filler aggregate**

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

**3.17****added filler**

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

**3.18****mixed filler**

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

**3.19****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.

**3.20****oversize**

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

**3.21****undersize**

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

**3.22****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 General requirements**

The tables in this standard include categories which are common across the four main aggregates standard: EN 12620, EN 13043, EN 13139 and EN 13242. Categories, NOTES, comments etc., which are grey shaded, are not used for bound and unbound materials for civil engineering works and road constructions.

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

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).

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  $F_{\text{Declared}}$  55 (Declared category).

When a property is not required, a "No requirement" category may be used.

**5 Geometrical requirements****5.1 General**

The necessity for testing and declaring all properties specified in Clause 5 shall be limited according to the particular application at end use or origin of the aggregate. When required, the tests specified in Clause 5 shall be carried out to determine appropriate geometrical properties.

**5.2 Aggregate sizes**

All aggregates shall be described in terms of aggregate sizes using the designations  $d/D$ , and shall comply with the grading requirements specified in 5.3, 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. 0/4 mm, 0/2 mm, 2/4 mm 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

Basic set mm	Basic set plus set 1 mm	Basic set plus set 2 mm
0	0	0
1	1	1
2	2	2
4	4	4
—	5,6 (5) <sup>a</sup>	—
—	—	6,3 (6) <sup>a</sup>
8	8	8
—	—	10
—	11,2 (11) <sup>a</sup>	—
—	—	12,5 (12) <sup>a</sup>
—	—	14
16	16	16
—	—	20
—	22,4 (22) <sup>a</sup>	—
31,5 (32) <sup>a</sup>	31,5 (32) <sup>a</sup>	31,5 (32) <sup>a</sup>
—	—	40
—	45	—
—	56	—
63	63	63
—	—	80
—	90 <sup>b</sup>	—

<sup>a</sup>Rounded sizes shown in parentheses can be used as simplified descriptions of aggregate sizes.

<sup>b</sup>Greater than 90 mm sieve sizes can be used for particular applications.

### 5.3 Grading

#### 5.3.1 General

The grading of the aggregate, when determined in accordance with EN 933-1, shall conform to the requirements of 5.3.2 to 5.3.5 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.

Size designations and grading categories are essentially categories of convenience and different declared sizes and grading categories may be agreed for use.

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

When a sieve size of the ISO 565-R20 series is closer to the calculated  $d/2$ ,  $D/1,4$ ,  $D/2$ ,  $1,4D$  or  $2D$  size, the manufacturer may choose to use this R20 size.

**Table 2 — General grading requirements**

Aggregate	Size mm	Percentage passing by mass					Category <i>G</i>
		$2D^a$	$1,4D$	$D^b$	$d^d$	$d/2$	
Coarse	$D > 4$ $d \geq 1$	100	100	90 to 99	0 to 10	0 to 2	$G_C$ 90/10
		100	98 to 100	90 to 99	0 to 15	0 to 5	$G_C$ 90/15
		100	98 to 100	90 to 99	0 to 20	0 to 5	$G_C$ 90/20
		<b>100</b>	<b>98 to 100</b>	<b>85 to 99<sup>c</sup></b>	<b>0 to 15</b>	<b>0 to 5</b>	<b><math>G_C</math> 85/15</b>
		100	98 to 100	85 to 99 <sup>c</sup>	0 to 20	0 to 5	$G_C$ 85/20
		<b>100</b>	<b>98 to 100</b>	<b>80 to 99</b>	<b>0 to 20</b>	<b>0 to 5</b>	<b><math>G_C</math> 80/20</b>
		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
	$D = 4$ $d \geq 1$	<b>100</b>	<b>95 to 100</b>	<b>85 to 99</b>	<b>0 to 15</b>	–	<b><math>G_G</math> 85/15</b>
		<b>100</b>	<b>98 to 100</b>	<b>85 to 99</b>	<b>0 to 20</b>	<b>0 to 5</b>	<b><math>G_G</math> 85/20</b>
100		98 to 100	85 to 99	0 to 35	0 to 5	$G_G$ 85/35	
Fine	$D = 4$	<b>100</b>	<b>95 to 100</b>	<b>85 to 99</b>	–	–	<b><math>G_F</math> 85</b>
	$d = 0$	<b>100</b>	<b>98 to 100</b>	<b>80 to 99</b>	–	–	<b><math>G_F</math> 80</b>
Natural graded aggregates	$D = 8$ $d = 0$	100	98 to 100	90 to 99	–	–	$G_{NG}$ 90
All-in	$D > 4$ $d = 0$	<b>100</b>	<b>98 to 100</b>	<b>90 to 99</b>	–	–	<b><math>G_A</math> 90</b>
		<b>100</b>	<b>98 to 100</b>	<b>85 to 99</b>	–	–	<b><math>G_A</math> 85</b>
		<b>100</b>	<b>98 to 100</b>	<b>80 to 99</b>	–	–	<b><math>G_A</math> 80</b>
		<b>100</b>	–	<b>75 to 99</b>	–	–	<b><math>G_A</math> 75</b>

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

<sup>b</sup> If the percentage retained on  $D$  is  $< 1\%$  by mass the manufacturer shall document and declare the typical grading including the sieves  $D$ ,  $d$ ,  $d/2$  and sieves in the basic set plus set 1 or basic set plus set 2 intermediate between  $d$  and  $D$ .

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

<sup>d</sup> Limits for the percentage passing  $d$  can be modified to 1 to 15 for  $G_C85/15$  and 1 to 20 for  $G_C80/20$  where necessary to ensure a well graded aggregate.

**5.3.2 Coarse aggregates**

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

When required for graded aggregates, defined as those where  $D/d \geq 2$ , all gradings shall conform to the overall limits in Table 3 appropriate to their grading category. The typical grading passing the mid-size sieve shall be declared and the tolerances selected from Table 3 appropriate to the grading category shall be applied.