SLOVENSKI STANDARD
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Agregati za gradbena dela - 1. del: Značilnosti

Aggregates for construction works - Part 1: Characteristics

Gesteinskörnungen für Bauwerke - Teil 1: Produktnorm

Granulats pour travaux de construction - Partie 1 : caractéristiques

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English Version

Aggregates for construction works - Part 1: Characteristics

Granulats pour travaux de construction - Partie 1 : caractéristiques

Gesteinskörnungen für Bauwerke - Teil 1: Produktnorm

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

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

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Contents

Page

European foreword

This document (prEN 17555-1:2021) has been prepared by Technical Committee CEN/TC 154 “Aggregates”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede the following set of standards:

— EN 12620:2002+A1:2008,

— EN 13043:2002, together with EN 13043:2002/AC:2004,

— EN 13139:2002, together with EN 13139:2002/AC:2004, and

— EN 13242:2002+A1:2007.

The most significant technical changes compared to EN 12620:2002+A1:2008, EN 13043:2002, together with EN 13043:2002/AC:2004, EN 13139:2002, together with EN 13139:2002/AC:2004, and EN 13242:2002+A1:2007 include:

a) unification and clarifications of the scope statement;

b) unification and improvement of definitions for aggregate families and other matters which were common across the four main aggregate standards EN 12620, EN 13043, EN 13139 and EN 13242, i.e. for coarse, fine, all-in aggregates, natural graded aggregates, grit and added fillers;

c) updating and improving references to supporting test methods;

d) consolidation of classes for characteristics, including:

   a. merging of classes which were common across the four main aggregate standards: EN 12620, EN 13043, EN 13139 and EN 13242;

   b. addition of classes to respond to requests from Member States;

   c. addition of intermediate classes to provide a more uniform sequence;

e) with regard to aggregates (not including added filler):

   a. unification of overall limits for graded coarse aggregates at mid-size sieves;

   b. removal of clauses referring to tolerances on grading;

   c. deletion of classes (and replacement with a simple level declaration) for proportions of constituents of recycled aggregates and for water absorption linked to freeze thaw resistance;

   d. addition of new classes for the following: grading, particle shape, crushed particles, fines content, sand equivalent value; methylene blue value; shell content, lightweight contaminators, resistance to fragmentation, resistance to wear, resistance to abrasion from studded tyres, total sulfur content, water soluble sulfate content of recycled aggregates, effect of organic contaminators on the rate of setting and hardening of concrete mortar and hydraulically bound mixtures – recycled aggregates, resistance to weathering – magnesium sulfate soundness;

e. introduction of aggregate proxy characteristics and classes for the following:, susceptibility to attrition; resistance to weathering – water absorption; water soluble sulfate content of coarse natural aggregates; resistance to freezing and thawing in the presence of salt;

f. formal addition of characteristics and some classes for the fine fraction of aggregates not including added filler. These are identical to the equivalent tests for added fillers and previously were just cross referenced to filler tests;

g. removal of simple petrographic description from the characteristics and inclusion instead under the marking labelling and packaging clause;

f) with regard to added fillers:

a. addition of new classes for total sulfur content, harmful fines, water content, volume of voids and change of the softening point, carbonate content of filler of limestone origin, loss on ignition;

b. removal of the clause relating to specific surface area of added filler;

c. introduction of a new characteristic and classes for carbonate content of composite filler;

g) restructuring of all clauses to be in line with the requirements of the Construction Product Regulations;

h) introduction of revised AVCP clauses and tables, although minimum test frequencies are almost unchanged.

Provisions for other types of aggregates and their intended uses are specified in the following European Standards:

— prEN 13055:2021, *Lightweight aggregates*

— prEN 13383-1:2021, *Armourstone — Part 1: Characteristics*

— prEN 13450-1:2021, *Aggregates for railway ballast — Part 1: Characteristics*

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with Regulation (EU) No. 305/2011 on construction products (CPR), see informative Annex ZA, which is an integral part of this document.

1 Scope

This document specifies the characteristics of aggregates, i.e. aggregates without added fillers (see 3.1.1 a) and added fillers (see 3.1.1 b), for uses, either with or without high safety requirements, for:

a) concrete for buildings, roads and other civil engineering works,

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

c) mortars, renders and screeds, e.g. masonry mortar, floor/screed mortar, surfacing of internal walls (plastering mortar), rendering of external walls, special bedding materials, repair mortar and grouts for buildings, roads and civil engineering works;

d) unbound and hydraulically bound materials for civil engineering works and road constructions.

With regard to the material source and production process, this document covers natural aggregate (see 3.1.2), manufactured aggregate (see 3.1.3), recycled aggregates (see 3.1.4), and mixtures of these materials.

Aggregates covered in this document are:

a) aggregates without added fillers, including coarse aggregates (see 3.1.8), grit (see 3.1.11), fine aggregates (see 3.1.12), all-in aggregates (see 3.1.13), natural graded aggregates (see 3.1.14); and

b) added fillers (see 3.1.15).

Coarse aggregates covered in this document are single sized coarse aggregates (see 3.1.9) and graded coarse aggregates (see 3.1.10).

Added fillers covered in this document are natural fillers (see 3.1.16), manufactured fillers (see 3.1.18), mixed fillers (see 3.1.19), composite fillers (see 3.1.20) and recycled fillers (see 3.1.21). Natural fillers include fillers of limestone origin (see 3.1.17).

This document does not cover:

— natural and manufactured aggregates, having oven-dried particle density less than or equal to 2,00 Mg/m³, as they are already specified in prEN 13055:2021,

— recycled aggregates, with particle densities less than 1,50 Mg/m³,

— aggregates with a nominal upper size greater than 90 mm,

— armourstone, as this is specified in prEN13383-1:2021,

— aggregates for railway ballast, as these are specified in prEN 13450-1:2021,

— use of aggregates contained within reclaimed bituminous mixtures, as the reclaimed asphalt for use as a constituent of bituminous mixtures is already specified in EN 13108-8:2016,

— use of aggregates as soil,

— use of aggregates in earthworks, as these are specified in EN 16907-2:2018.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 196-2:2013, *Method of testing cement - Part 2: Chemical analysis of cement*

EN 459-2:—,[1] *Building lime — Part 2: Test methods*

prEN 932-3:2021, *Tests for general properties of aggregates — Part 3: Procedure and terminology for simplified petrographic description*

prEN 933-1:2021, *Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method*

EN 933-3:2012, *Tests for geometrical properties of aggregates - Part 3: Determination of particle shape - Flakiness index*

EN 933-4:2008, *Tests for geometrical properties of aggregates - Part 4: Determination of particle shape - Shape index*

prEN 933-5:2021, *Tests for geometrical properties of aggregates — Part 5: Determination of percentage of crushed and broken surfaces in coarse aggregate particles*

prEN 933-6:2021, *Tests for geometrical properties of aggregates — Part 6: Assessment of surface characteristics — Flow coefficient of aggregates*

EN 933-7:1998, *Tests for geometrical properties of aggregates - Part 7: Determination of shell content - Percentage of shells in coarse aggregates*

EN 933-8:2012+A1:2015, *Tests for geometrical properties of aggregates - Part 8: Assessment of fines - Sand equivalent test*

prEN 933-9:2021, *Tests for geometrical properties of aggregates — Part 9: Assessment of fines — Methylene blue test*

EN 933-10:2009, *Tests for geometrical properties of aggregates - Part 10: Assessment of fines - Grading of filler aggregates (air jet sieving)*

prEN 933-11:2021, *Tests for geometrical properties of aggregates — Part 11: Classification test for the constituents of coarse recycled aggregate*

prEN 1097-1:2021, *Tests for mechanical and physical properties of aggregates — Part 1: Determination of the resistance to wear (micro-Deval)*

EN 1097-2:2020, *Tests for mechanical and physical properties of aggregates - Part 2: Methods for the determination of resistance to fragmentation*

EN 1097-4:2008, *Tests for mechanical and physical properties of aggregates - Part 4: Determination of the voids of dry compacted filler*

[1] To be published. Stage at the time of publication: EN 459-2:2021.

EN 1097-5:2008, *Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven*

prEN 1097-6:2021, *Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption*

prEN 1097-7:2021, *Tests for mechanical and physical properties of aggregates - Part 7: Determination of the particle density of filler — Pyknometer method*

EN 1097-8:2020, *Tests for mechanical and physical properties of aggregates - Part 8: Determination of the polished stone value*

EN 1097-9:2014, *Tests for mechanical and physical properties of aggregates - Part 9: Determination of the resistance to wear by abrasion from studded tyres - Nordic test*

EN 1097-10:2014, *Tests for mechanical and physical properties of aggregates - Part 10: Determination of water suction height*

EN 1367-1:2007, *Tests for thermal and weathering properties of aggregates - Part 1: Determination of resistance to freezing and thawing*

EN 1367-2:2009, *Tests for thermal and weathering properties of aggregates — Part 2: Magnesium sulfate test*

EN 1367-3:2001,[2] *Tests for thermal and weathering properties of aggregates - Part 3 : Boiling test for "Sonnenbrand basalt"*

EN 1367-4:2008, *Tests for thermal and weathering properties of aggregates - Part 4: Determination of drying shrinkage*

EN 1367-5:2011, *Tests for thermal and weathering properties of aggregates - Part 5: Determination of resistance to thermal shock*

EN 1367-6:2008, *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+A1:2012, *Tests for chemical properties of aggregates - Part 1: Chemical analysis*

EN 1744-4:2005, *Tests for chemical properties of aggregates - Part 4: Determination of water susceptibility of fillers for bituminous mixtures*

EN 1744-5:2006, *Tests for chemical properties of aggregates - Part 5: Determination of acid soluble chloride salts*

EN 1744-6:2006, *Tests for chemical properties of aggregates - Part 6: Determination of the influence of recycled aggregate extract on the initial setting time of cement*

EN 13179-1:2013, *Tests for filler aggregate used in bituminous mixtures - Part 1: Delta ring and ball test*

EN 13179-2:2000, *Tests for filler aggregate used in bituminous mixtures — Part 2: Bitumen number*

[2] As impacted by EN 1367-3:2001/AC:2004.

3 Terms, definitions, symbols and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1
aggregate
granular material of natural, manufactured or recycled origin used in construction, and including:

a) aggregates without added fillers, and

b) added fillers

3.1.2
natural aggregate
aggregate from mineral sources that has been subjected to nothing more than mechanical processing and sometimes washing

3.1.3
manufactured aggregate
aggregate of mineral origin resulting from an industrial process involving thermal or other modification

Note 1 to entry: Manufactured aggregates (not including added filler) are of different types, including those, namely air-cooled blast furnace slags, steel slags and foundry cupola furnace slags, for which this standard defines application of specific test methods to cover some essential characteristics.

3.1.4
recycled aggregate
aggregate resulting from the processing of mineral material either previously used in construction or from the processing of the residues of material production

Note 1 to entry: Recycled aggregates can also be obtained from production residues e.g. crushed unused concrete.

3.1.5
aggregate size
designation of aggregate in terms of lower (d) and upper (D) sieve sizes expressed as d/D, where $d/D < 0{,}72$

Note 1 to entry: Sieve sizes are selected from those in EN 933-2:2020.

Note 2 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).

3.1.6
grading
particle size distribution expressed as the percentages by mass passing a specified set of sieves

Note 1 to entry: The grading classes are designated as G_n X/Y (n = C, CA, G or GA) or as G_n X (n = F, NG or A) in which:

n: type of grading defined below:

C = coarse;

CA = coarse aggregates for bituminous mixtures only;

G = grit;

GA = grit for bituminous mixtures only;

F = fine;

NG = natural graded;

A = all-in;

X :minimum percentage by mass passing the upper (D) sieve size;

Y :maximum percentage by mass passing the lower (d) sieve size.

3.1.7
fines
particle size fraction of an aggregate that passes the 0,063 mm sieve

3.1.8
coarse aggregate
designation given to the larger aggregate sizes with D greater than 4 mm and less than 90mm and d greater than or equal to 1 mm

3.1.9
single sized coarse aggregate
designation given to coarse aggregate where either

D > 11,2 mm and $D/d \leq 2$ or

$D \leq$ 11,2 mm and $D/d \leq 4$

3.1.10
graded coarse aggregate
designation given to coarse aggregate where either

D > 11,2 mm and D/d > 2 or

$D \leq$ 11,2mm and D/d > 4

3.1.11
grit
designation given to the aggregate sizes with D less than or equal to 4 mm and d greater than or equal to 1 mm

3.1.12
fine aggregate
designation given to the smaller aggregate sizes with D less than or equal to 4 mm and d equal to 0

3.1.13
all-in aggregate
processed aggregate consisting of a mixture of coarse and fine aggregates with *D* greater than 4 mm and *d* equal to 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.

3.1.14
natural graded aggregate
designation given to natural aggregate sizes of glacial and/or fluvial origin with *D* less than or equal to 8 mm and *d* equal to 0

3.1.15
added filler
aggregate, at least 70% of which passes the 0,063 mm sieve, that has been produced separately, which can be added to construction materials to provide their performances required for certain end uses

Note 1 to entry: Added filler is sometimes described as 'filler aggregate'.

3.1.16
natural filler
added filler from mineral sources that has been subjected to nothing more than mechanical processing

3.1.17
filler of limestone origin

added filler produced from limestone, dolomitised limestone or dolomite

3.1.18

manufactured filler
added filler of mineral origin resulting from an industrial process involving thermal or other modification

Note 1 to entry: Manufactured added fillers are of different types, including those, namely fly ashes, for which this standard defines application of specific test methods to cover some essential characteristics. .

3.1.19
mixed filler
added filler comprising natural or manufactured filler mixed with calcium hydroxide

3.1.20
composite filler
added filler comprising filler of limestone origin mixed with fly ash

3.1.21
recycled filler
added filler resulting from the processing of mineral material either previously used in construction or obtained from the residues of material production

3.1.22
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.

3.1.23
oversize
part of the aggregate retained on the upper of the limiting sieves used in aggregate size description

3.1.24
undersize
part of the aggregate passing the lower of the limiting sieves used in aggregate size description

3.1.25
product family
group of products produced by one manufacturer for which the assessment results for one or more characteristics from any one product within the range are valid for all other products within this range

3.2 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviations apply:

Symbol/Acronym	Meaning:
A	Change in the initial setting time
AAV	Aggregate Abrasion Value
A_{N}	Resistance against abrasion from studded tires (Nordic Abrasion value)
AS	Acid-soluble sulfate content
AVCP	Assessment for Verification of Constancy of Performance
BN	Bitumen Number (of added filler)
C	(Percentage of) Crushed particles
CC_{f}	Carbonate Content of composite filler
CC_{l}	Carbonate Content of filler of limestone origin
d	lower sieve size designation in mm
D	upper sieve size designation in mm
d/D	Aggregate size designation
E_{CS}	Flow coefficient of fine aggregates
f	Fines content
F	Freeze thaw resistance
F_{EC}	Freeze thaw resistance in the presence of salt (extreme conditions)
FI	Flakiness Index
G_{n} X/Y	Grading (for “n”, “X” and “Y” see 3.1.6)
I	Percentage passing the 5 mm sieve after thermal shock
Ka	Calcium hydroxide content (of mixed filler)
LA	Los Angeles coefficient
L_i	Loss on ignition
MB, MB_{A}	Methylene Blue value

Symbol/Acronym	Meaning:
MB_F	Methylene Blue value of filler
M_{DE}	Micro-Deval coefficient
m_{LPC}	Lightweight contaminators
MS	Magnesium Sulfate soundness
PSV	Polished stone value
Q	Swelling of a Marshall specimen
S	Total sulfur content
SC	Shell content
SE_{10}, SE_4	Sand equivalent value
SI	Shape Index
SS	Water-soluble sulfate content
SZ	Impact value
v	voids content of dry compacted filler (Rigden)
V	Volume Stability
V_{LA}	Absolute loss of Los Angeles coefficient after thermal shock
V_{SZ}	Absolute loss of impact value after thermal shock
WC	Water Content (of added filler)
WS	Water Solubility (of filler)
$\Delta_{R\&B}$	Delta Ring and Ball (softening point)