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

Prüfverfahren für allgemeine Eigenschaften von Gesteinskörnungen - Teil 3: Durchführung und Terminologie einer vereinfachten petrographischen Beschreibung

Essais pour déterminer les propriétés générales des granulats - Partie 3 : Procédure et terminologie pour la description pétrographique simplifiée

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

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European foreword

This document (EN 932-3:2022) 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of an identical text or by endorsement, at the latest by December 2022, and conflicting national standards shall be withdrawn at the latest by December 2022.

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.

This document supersedes EN 932-3:1996.

In comparison with the previous edition, the following technical modifications have been made:

a) The Scope has been revised to emphasize that the method only applies for simplified (not precise) petrographic description of natural aggregates, and that it does not apply to manufactured or recycled aggregates. The Scope, and the whole standard, now uses the term petrographic type, which is used in the product standards. Note 1 has been reworded to show the role of the petrographer, without normative wording. Presentation of Annex A has been included;

b) The Foreword and Normative references have been updated;

c) Clauses 3 Terms and definitions and 4 Reagent and apparatus have been extended;

d) Clauses 5 Sampling, 6 Description of a rock sample and 7 Description of an aggregate sample, have been revised. They have been clarified, restructured and renamed to 5 Sampling and preparation of test portion and 6 Test procedure, which is further divided into examination, description and designation;

e) Test report has been revised and adapted to the current rules;

f) Annex A has been updated, restructured and extended with three illustrating figures;

g) The Bibliography has been updated and extended.

This document forms part of a series of standards for general properties of aggregates. Test methods for other properties of aggregates are covered by the following European Standards:

— EN 933 (all parts), *Tests for geometrical properties of aggregates*

— EN 1097 (all parts), *Tests for mechanical and physical properties of aggregates*

— EN 1367 (all parts), *Tests for thermal and weathering properties of aggregates*

— EN 1744 (all parts), *Tests for chemical properties of aggregates*

— EN 13179 (all parts), *Tests for filler aggregate used in bituminous mixtures*

The other parts of EN 932 include:

— *Part 1: Methods for sampling*

— *Part 2: Methods for reducing laboratory samples*

— *Part 5: Common equipment and calibration*

— *Part 6: Definitions of repeatability and reproducibility*

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies a basic procedure for the identification of the petrographic type of natural aggregates. It applies for usual requirements for the procedure and terminology for simplified petrographic description. Precise petrographic identification, of technical mineralogy and petrography for civil engineering or specific end uses, requires further examination and is therefore excluded from the scope of this document.

NOTE 1 In principle, a qualified geologist (petrographer), with experience of materials used in civil engineering and aware of the composition of the deposit, has sufficient skills to sample and name the rock.

NOTE 2 For precise petrographic identification and technical requirements for specific applications, a non-exhaustive list of reference literature is given in the Bibliography.

This document applies only to natural aggregates. It is used to describe rocks and sediments. It does not apply to the description and identification of manufactured or recycled aggregates.

Informative Annex A provides guidance on the petrographic nomenclature by giving definitions of simple petrographic terms applicable to rock types used for aggregates.

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 932-1, *Tests for general properties of aggregates - Part 1: Methods for sampling*

EN 932-2, *Tests for general properties of aggregates - Part 2: Methods for reducing laboratory samples*

EN 933-2, *Tests for geometrical properties of aggregates - Part 2: Determination of particle size distribution - Test sieves, nominal size of apertures*

3 Terms and definitions

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/ui

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

3.1
rocks
3.1.1
rock
natural solid substance composed of crystals or minerals

Note 1 to entry: The term also includes the relatively rare natural glasses. Rocks are classified into three categories according to their origin: igneous, sedimentary and metamorphic.

3.1.2
igneous rock
rock crystallized from molten rock (magma) either at or below the earth's surface, with a nomenclature which is based on the mineralogical composition

Note 1 to entry: Rocks formed below the earth's surface can be divided into two classes, plutonic and hypabyssal. Plutonic rocks are formed at depth in large bodies and typically have a coarse crystalline texture, with crystals clearly visible to the naked eye. Hypabyssal rocks are formed in smaller bodies near, but not at, the earth's surface and have usually a fine crystalline texture.

Note 2 to entry: Extrusive or volcanic rocks are formed as lavas and pyroclastics at the earth's surface and have a very fine or glassy texture.

3.1.3
sedimentary rock
rock formed by solidification of sedimentary deposits, trough diagenesis and lithification

Note 1 to entry: Generally, sedimentary rocks are stratified and they are classified into the same categories as sediment. Both sedimentary rocks and sediments form the sedimentary materials.

3.1.4
metamorphic rock
rock transformed from a pre-existing rock by fluids or heat (contact metamorphism) and pressure in the earth's crust (burial metamorphism)

Note 1 to entry: Metamorphism changes the mineral content and composition and the microstructure of the pre-existing rock, dominantly by solid state chemical reactions. Metamorphism is often associated with tectonic processes and therefore, metamorphic rocks frequently have anisotropic textures.

3.2
sediment
natural deposit composed of unsolidified fragments of rocks or minerals

Note 1 to entry: Sediments are classified into three categories according to their origin: clastic or detrital, chemical and biogenic. Clastic sediments are products of mechanical weathering (e.g. sand or gravel), chemical sediments are products of chemical weathering (e.g. kaolin clay) and biogenic sediments are products of organisms (fossils, microfossils, etc.).

3.3
laboratory sample
sample intended for laboratory testing

3.4
test portion
sample used as a whole in a single test

4 Reagent and apparatus

4.1 Test sieves, of nominal size of apertures conforming to EN 933-2, including at least the 4 mm sieve.

4.2 Hand lens.

4.3 Pen knife.

4.4 Stereoscopic microscope, with a magnification of typically 10× to 100×.

4.5 Polarizing microscope, optional.

4.6 Reagent, diluted hydrochloric acid.

NOTE Typically, limestone reacts with hydrochloric acid diluted to ~10 % and dolomite reacts with hydrochloric acid diluted to ~20 %.

4.7 Magnet, optional.

5 Sampling and preparation of test portion

5.1 General

The laboratory sample shall be taken either from exposed faces of exploitation sites or drill cores, or from stock piles for aggregates. In the case of aggregates, the sampling shall be carried out according to EN 932-1.

5.2 Rock sample

The mass of the test portion for examination shall be not less than 5 kg.

5.3 Aggregates

The minimum mass of the laboratory sample depends on the aggregate size D and on the petrographic heterogeneity of the aggregates.

Samples (laboratory sample and other samples) shall be reduced in accordance with the requirements of EN 932-2 to produce the test portion. The size of the test portion should be representative of the material.

NOTE In the case of heterogeneous aggregates (when no single petrographic type or mineral is predominant, the material is said to be "heterogeneous"), generally 150 particles are sufficient for the examination.

6 Test procedure

6.1 Description of a rock sample

6.1.1 Examination and description

First, examine the sample visually to determine the constituent rock or mineral types.

NOTE 1 It can be appropriate to wash the sample before examination.

Then, inspect each rock type carefully using a hand lens or a stereoscopic microscope and other appropriate means.

Describe the sample and include the following:

a) grain size of the main constituents, texture, anisotropy, porosity, vesicularity (in volcanic rocks) and colour;

b) main minerals that can be identified (quartz, feldspars, calcite, dolomite, etc.);

c) state of alteration and weathering.

NOTE 2 The description can also include comments on the presence, even in small quantities, of some constituents which can be of concern in particular circumstances (such as opal, micas or other phyllosilicates, sulphates, iron sulphides, other sulphides and organic materials).

6.1.2 Designation

From the examination specified in 6.1.1, assign if possible, an appropriate name to the rock, preferably selected from the nomenclature given in Annex A.

6.2 Description of an aggregate test portion

6.2.1 General

Aggregates derived from natural deposits consist mainly of:

a) mineral particles;

b) rock fragments.

The methods of examination and description in 6.2.2 as well as the designation described in 6.2.3 shall be used only for particle sizes between 0,1 mm and 63 mm.

NOTE 1 It can be appropriate to wash the test portion before examination.

NOTE 2 The composition of aggregates often varies between size fractions. Hence, before carrying out the examination, it can be necessary to divide the aggregate into closely sized fractions which can be examined separately. The proportions of constituents can then be estimated by counting the particles in size fractions.

6.2.2 Examination and description

Particles retained on a 4 mm sieve may be examined with the naked eye, or preferably with a hand lens or stereoscopic microscope. For finer grains, the stereoscopic microscope shall be used.

NOTE In some cases, other methods can be used (e.g. magnet for identification of the presence of magnetic particles, acid test for the calcite identification, X-ray diffraction, thin sections for the examination by means of a polarizing microscope). One method for the preparation and examination of thin sections is described in detail in EN 12407 (more than one section can be necessary if the rock is coarse-grained or heterogeneous).

The description shall include:

a) the shape, surface conditions (roughness, etc.) and roundness of particles;

b) a petrographic identification of the main minerals (quartz, feldspars, calcite, dolomite, etc.).

6.2.3 Designation

6.2.3.1 General

When a petrographic type or mineral is predominant (more than 50 %), its presence shall be reflected in the name of the material. For example:

— quartzose sand (sand in which more than 50 % of the grains are quartz grains);

— basaltic gravel (gravel in which more than 50 % of the particles consist of basalt fragments).

NOTE In this context, sand and gravel are understood in terms of geological definitions (see A.3.2.1 and A.3.2.2) and not as geometric definitions.

When no single petrographic type or mineral is predominant, the material is said to be “heterogeneous” and its name should include the most frequent type(s). For example:

— quartzo-feldspathic sand;

— siliceous gravel.

6.2.3.2 Individual particles in an aggregate

The designation shall include the following:

a) petrographic type;

NOTE Informative Annex A contains a nomenclature of the most types of rock used for aggregates.

b) minerals, e.g. quartz, feldspars, micas, calcite;

c) shell fragments.

7 Test report

7.1 Required data

The test report shall include the following information:

a) reference to this document, including its year of publication;

b) identification of the test sample, including the origin;

c) identification of the laboratory;

d) date of test;

e) petrographic description, according to 6.1 for rocks and 6.2 for aggregates;

f) deviations from the reference method, if any;

g) any unusual features observed.

7.2 Optional data

The test report can include the following information:

a) reference to the chosen sampling procedure;

b) reference to the chosen sample reduction procedure;

c) mass of the rock sample or test portion;