SLOVENSKI STANDARD
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Preskusi splošnih lastnosti agregatov - 1. del: Metode vzorčenja

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

Prüfverfahren für allgemeine Eigenschaften von Gesteinskörnungen - Teil 1: Probenahmeverfahren

Essais pour déterminer les propriétés générales des granulats - Partie 1: Méthodes d'échantillonnage

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by February1997, and conflicting national standards shall be withdrawn at the latest by February 1997.

This European Standard is one of a series of standards for tests for general properties of aggregates as listed below.

prEN 932-2:	Tests for general properties of aggregates Part 2: Methods for reducing laboratory samples
EN 932-3:	Tests for general properties of aggregates Part 3: Procedure and terminology for simplified petrographic description
prEN 932-4:	Tests for general properties of aggregates[1)] Part 4: Quantitative and qualitative system for description and petrography
prEN 932-5:	Tests for general properties of aggregates Part 5: Common equipment and calibration
prEN 932-6:	Tests for general properties of aggregates Part 6: Definitions of repeatability and reproducibility
prEN 932-7:	Tests for general properties of aggregates Part 7: Conformity criteria for test results[1)]

Test methods for other properties of aggregates are covered by Parts of the following European Standards:

EN 933	Tests for geometrical properties of aggregates
EN 1097	Tests for mechanical and physical properties of aggregates
EN 1367	Tests for thermal and weathering properties of aggregates
EN 1744	Tests for chemical properties of aggregates

According to CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1) In course of preparation

1 Scope

This European Standard specifies methods for obtaining samples of aggregates from deliveries, preparation and processing plants including stocks.

The aim of sampling is to obtain a bulk sample that is representative of the average properties of the batch.

The methods specified in this standard are also suitable for obtaining sampling increments which may be tested separately.

Methods to be used for sample reduction are also given.

The methods specified in this European Standard are based on manual procedures. Mechanical, or automatic sampling and sample reduction may also be used. Criteria for the design and the assessment of such equipment are given in annex **A**.

The methods specified in this European Standard are limited to civil engineering purposes.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

prEN 932-5 Tests for general properties of aggregates
Part 5: Common equipment and calibration

3 Definitions

For the purposes of this European Standard, the following definitions apply:

3.1 batch: A 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: With a continuous process the quantity produced during an agreed period is treated as a batch.

3.2 sampling increment: A quantity of material taken from a batch by one operation of the sampling apparatus.

3.3 bulk sample: An aggregation of the sampling increments.

3.4 representative sample: A bulk sample created by taking sampling increments according to a sampling plan, which makes it likely that the quality of this sample corresponds to that of the batch.

3.5 subsample: A sample obtained from sampling increments or a bulk sample by means of a sample reduction procedure.

3.6 laboratory sample: A reduced sample derived from a bulk sample for laboratory testing.

3.7 sampler: An individual, a number of individuals working as a team, or an organization, taking samples on a routine basis.

4 Principles of sampling

Proper and careful sampling and sample transport is a prerequisite for an analysis that will give reliable results. The correct use of the specified apparatus helps to avoid biased sampling.
Sampling variation caused by the heterogeneity of the batch is reduced to an acceptable level by taking an adequate number of sampling increments. If the aggregate is homogenized by production processes, one large increment may be representative of the batch.

Sampling increments are selected at random from all parts of the batch that the bulk sample is to represent. Aggregate from which no sampling increment can be taken (because it is not accessible, or for some other practical reason) shall not be considered to be part of the batch that is represented by the bulk sample. For example, if sampling increments are taken from aggregate discharged from a silo, the bulk sample represents the aggregate that has been discharged, not the aggregate remaining in the silo.

The sampler shall be informed of the aim of the sampling.

5 Bulk sample and sampling increment quantity and number

The bulk sample quantity shall be calculated taking into account the nature and number of tests, the aggregate sizes, and the density of the aggregate. If there is a need for testing separate sampling increments, instead of the bulk sample, the quantity of the sampling increments shall be calculated on the same parameters as given above. Choose the number of sampling increments taken to form the bulk sample on the basis of past experience of sampling similar aggregates from similar production processes. This experience shall preferably be the recorded result of experiments.

NOTE 1: It is recommended that the minimum mass of a bulk sample be calculated in accordance with the following equation:

$$M = 6 \times \sqrt{D} \times \rho_b$$

where :

M is the mass of the sample, in kilograms;
D is the maximum grain size, in millimetres;
ρ_b is the loose bulk density, in megagrams per cubic metre, determined as specified in prEN 1097-3.

NOTE 2: A procedure that producers can use to check that they are taking numbers of sampling increments that are adequate for their products and processes is given in annex **B**.

6 Sampling plan

A sampling plan shall be prepared, prior to sampling, taking into account the aggregate size, the nature and size of the batch, the local circumstances and the purposes of sampling. It shall include:

- the type of the aggregates;
- the aim of the sampling including a list of the properties to be tested;
- the identification of the sampling points;
- the approximate mass of sampling increments;
- the number of sampling increments;
- the sampling apparatus to be used;
- the methods of sampling and sample reduction with reference to the clauses of this European Standard;
- the marking, packaging and dispatch of the samples.

7 Apparatus

All apparatus shall comply with the general requirements of prEN 932-5.

NOTE 1: General advice for apparatus to be used in sampling and sample reduction is given in annex **A**.

In all cases the width *w* of the opening of apparatus used in sampling shall be not less than three times the upper aggregate size of the batch and in no case less than 10 mm.

NOTE 2: The same applies to the dimensions indicated in the figures of annex **A**.

Equipment to be used in sample reduction is also given in annex **A**.

NOTE 3: In all cases, alternative designs may be used so long as the essential dimensions of width of opening and length are met and the devices can be used to fulfil the sampling methods described in clause **8** or the reduction methods described in clause **9**.

8 Sampling procedures

8.1 General

Regulations for safety and ergonomics shall be followed.

NOTE 1: The sampling methods will inevitably involve the samplers working close to processing plant and moving vehicles. Those involved in the planning and execution of sampling should work closely with the operational management to ensure safe working practices.

NOTE 2: Aggregates should preferably be sampled from a stationary conveyor belt or from the stream of material. Sampling increments should be taken at regular intervals throughout the period the batch is in motion.

NOTE 3: When sampling from stockpiles as described in **8.8** is carried out, it is difficult to satisfy the principle of taking sampling increments at random from all parts of the batch, so that segregation can cause the sampling to produce biased results. Therefore, this method, wherever possible, should be avoided.

Manual sampling with shovels or scoops etc shall not be applied to moving materials.

8.2 Sampling from stationary conveyor belts

NOTE 1: Sampling should only be started after a preliminary run to ensure that possible irregularities in the pass do not cause a false sample to be taken.

All sampling increments shall be taken at the same sampling point. The material shall be taken across the complete cross section of the belt in every sampling increment.

NOTE 2: The sampling frame (see **A.3**) should be used to separate the material that is to be taken as the sampling increment at the sampling point. As an alternative to the use of the sampling frame a shovel or a flat piece of metal can be used to separate the sampling increment at both ends from the material remaining on the belt. This increment should have the length of about three times the width of the material stream on the belt or a minimum mass as calculated according to the equation given in clause **5**.

8.3 Sampling at belt and chute discharge points

NOTE 1: Mechanical apparatus provides the most practical means of taking samples from belt and chute discharge points. Manual sampling should be avoided if possible, due to both errors and dangers involved.

The period during which the sampling is to be done shall be divided into a number of equal intervals, and a sampling increment shall be taken in the middle of each interval.

A sampling increment shall be taken by passing the sampling receptacle e.g. the sampling box (see **A.4**) through the discharge stream in a uniform movement, making sure that the complete cross section of the stream of material is intercepted.

NOTE 2: Where appropriate, sampling should only be started after a preliminary run to ensure that possible irregularities in the pass do not cause a false sample to be taken.

NOTE 3: Samples can also be taken at the discharge from a screen by the same method.

8.4 Sampling of pneumatically transported aggregates

Sampling from the pneumatic transport in a plant shall be carried out in accordance with 8.3 and by means of sampling equipment installed by the producer.

This sampling equipment, mostly based on a by-pass principle, shall be designed in such a way that the whole stream of the aggregate can be interrupted to form an increment through the bypass.

8.5 Sampling of packed aggregates

When aggregate is packed in bags, drums or other small containers, a bulk sample shall be obtained by selecting a number of packs at random.

NOTE: A whole pack can be taken as a sampling increment, or the sampling spear (see **A.6**) used to take one sampling increment from each of the selected packs, or each of the selected packs can be reduced by one of the procedures described in clause **9**.

Whenever possible random selection of packs shall be achieved by selecting packs at random times as they pass a chosen sampling point during loading or unloading, or by numbering all the packs and using random numbers (see annexes **D** and **E**).

8.6 Sampling of material in bucket conveyors, bucket loaders, or grabs

Each sampling increment shall consist of the entire contents of a grab or bucket.

NOTE: When this gives too large a sampling increment, it should be reduced by one of the methods described in clause **9**, or discharged to form a small stockpile and sampled according to **8.8**.

8.7 Sampling from a silo

Sampling at an outlet shall be carried out in accordance with **8.3**.

The silo shall be opened sufficiently to ensure a uniform material flow without segregation; this requires an aperture at least three times the diameter of the maximum grain diameter. For aggregates with a lower size above 32 mm an aperture of at least 200 mm is required.

8.8 Sampling from stockpiles

Sampling increments of approximately equal size shall be taken from different points at different heights or depths, distributed over the complete stockpile (see figure **1**). The location and number of sampling increments shall take into account the way in which the stockpile was built, its shape and the possibility of segregation within the stockpile. A sampling increment shall be taken using a scoop (see **A.1**), a shovel (see **A.2**) or a grab (**A.7**) from the deepest point of each hole.

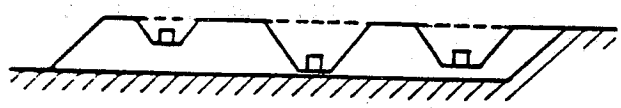

Figure 1: Sampling from flat stockpiles

NOTE. Conical stockpiles present special problems. Further guidance on sampling from such stockpiles is given in annex **C**.

8.9 Sampling from railway wagons, lorries and ships

Sampling of single-sized aggregates and of free flowing fine aggregate from lorries may be carried out as described in **8.8**.

Sampling of fine aggregate from lorries may also be carried out by using the sampling tube (see **A.5**); each sampling increment shall be taken by inserting the tube vertically down through the full depth of the aggregate.

In other situations, proper sampling from railway wagons, lorries or ships may not be possible. Sampling shall therefore be carried out wherever possible during loading or discharge according to **8.2**, **8.3** or **8.6**. Only when this is not possible, the aggregate shall be discharged to form a stockpile and sampled according to **8.8**.

9 Sample reduction

9.1 General

The procedure described in **9.2** shall preferably be used for the preparation of laboratory samples from bulk samples of aggregates. The procedures described in **9.4**, **9.5** and **9.6** may be used when the other methods are not suitable or the devices are not available. All the procedures may also be used in combination, for example by using quartering for the first few reduction stages followed by riffling.

NOTE: For all-in aggregates with an upper aggregate size of more than 63 mm, it may be suitable to remove aggregates coarser than 63 mm and treat them separately.

If necessary, the bulk sample shall be brought to a condition in which it is free-flowing but not so dry that fines will be lost or accretion occurs.

For mixing, and other operations that require a working surface, use a clean, flat, hard surface such as a sampling tray (see **A.9**) or a glass plate (for fillers). If a shovel is required it shall be in accordance with clause **7**.

If a rotatory sample divider is available it is preferred for sample reduction.

9.2 Reduction of a bulk sample using a riffle box

Put the bulk sample into one of the riffle box (see **A.10**) receptacles and place the other two in position. Pour the aggregate from the long side of the receptacle down the centre line of the riffle box. Discard the aggregate that falls into one of the other two receptacles. Repeat as many times as are needed to arrive at the required size of laboratory sample.

If the bulk sample is too large to go into the riffle box receptacle, divide up the bulk sample into subsamples that are small enough, reduce each by the same number of riffling stages, then combine the reduced subsamples.

9.3 Reduction of sampling increments using a riffle box

When the sampling increments have been kept separate, use the procedure described in **9.2** to reduce each increment by the same number of riffling stages. If required, combine the reduced sampling increments to form the laboratory sample.

9.4 Reduction of a bulk sample by quartering

Place the bulk sample on the working surface and mix it thoroughly by heaping it up to form a cone, and turning it over with the shovel to form a new cone.

Repeat this operation three times. When forming the cones, deposit each shovelful on the peak of the new cone in such a way that the aggregate runs down all sides of the cone and is evenly distributed so that the different sizes become well-mixed.