



SLOVENSKI STANDARD

SIST EN 933-3:1999

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Preskusi geometričnih lastnosti agregatov - 3. del: Določevanje oblike zrn - Modul ploščatosti

Tests for geometrical properties of aggregates - Part 3: Determination of particle shape - Flakiness index

Prüfverfahren für geometrische Eigenschaften von Gesteinskörnungen - Teil 3: Bestimmung der Kornform - Plattigkeitskennzahl

Essais pour déterminer les caractéristiques géométriques des granulats - Partie 3: Détermination de la forme des granulats - Coefficient d'aplatissement

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Ta slovenski standard je istoveten z: EN 933-3:1997

ICS:

91.100.15 Mineralni materiali in izdelki Mineral materials and products

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en

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EUROPEAN STANDARD

EN 933-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 1997

ICS 91.100.20

Descriptors: aggregates, tests, geometric characteristics, flattening tests

English version

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

Essais pour déterminer les caractéristiques
géométriques des granulats - Partie 3:
Détermination de la forme des granulats -
Coefficient d'aplatissement

Prüfverfahren für geometrische Eigenschaften
von Gesteinskörnungen - Teil 3: Bestimmung der
Kornform - Plattigkeitskennzahl

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This European Standard was approved by CEN on 1996-12-15. 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 Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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

Contents

	Page
Foreword	3
1 Scope	4
2 Normative references	4
3 Definitions	4
4 Principle	4
5 Apparatus	5
6 Preparation of test portions	7
7 Procedure	7
8 Calculation and expression of results	7
9 Test report	8
Annex A (informative) Example of test data sheet used for determining the flakiness index	9
Annex B (informative) Precision	10

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 July 1997, and conflicting national standards shall be withdrawn at the latest by July 1997.

This Standard forms part of a series of tests for geometrical properties of aggregates. Test methods for other properties of aggregates will be covered by Parts of the following draft European Standards:

prEN 932	Tests for general properties of aggregates
prEN 1097	Tests for mechanical and physical properties of aggregates
prEN 1367	Tests for thermal and weathering properties of aggregates
prEN 1744	Tests for chemical properties of aggregates

The other parts of prEN 933 will be:

- Part 1: Determination of particle size distribution - Sieving method
- Part 2: Determination of particle size distribution - Test sieves, nominal size of apertures
- Part 4: Determination of particle shape - Shape index
- Part 5: Determination of crushed and broken surfaces in coarse aggregate particles
- Part 6: Determination of texture/shape - Flow coefficient of coarse aggregates
- Part 7: Determination of shell content - Percentage of shells for coarse aggregates
- Part 8: Assessment of fines - Sand equivalent test
- Part 9: Assessment of fines - Methylene blue test
- Part 10: Determination of fines - Grading of fillers (air jet sieving)

According to the 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 Scope

This Part of this European Standard specifies the procedure for the determination of the flakiness index of aggregate and applies to aggregates of natural or artificial origin, including lightweight aggregates.

The test procedure specified in this Part of this European Standard is not applicable to particle sizes less than 4 mm or greater than 80 mm.

2 Normative references

This European Standard incorporates by dated or by 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 932-2	Tests for general properties of aggregates - Part 2: Methods for reducing laboratory samples
prEN 932-5	Tests for general properties of aggregates Part 5: Common equipment and calibration
prEN 933-1	Tests for geometrical properties of aggregates Part 1: Determination of particle size distribution - - Sieving method
EN 933-2	Tests for geometrical properties of aggregates Part 2: Determination of particle size distribution - Test sieves, nominal size of apertures

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 particle size fraction: Fraction of an aggregate passing the larger of two sieves and retained on the smaller.

NOTE: The lower limit may be zero.

3.2 test portion: The sample used as a whole in a single test.

3.3 constant mass: Successive weighings after drying at least 1 h apart not differing by more than 0,1 %.

NOTE: In many cases constant mass can be achieved after a test portion has been dried for a pre-determined period in a specified oven (see 5.4) at (110 ± 5) °C. Test laboratories can determine the time required to achieve constant mass for specific types and sizes of sample dependent upon the drying capacity of the oven used.

4 Principle

The test consists of two sieving operations. First, using test sieves, the sample is separated into various particle size fractions d_i/D_i , as given in table 1. Each of the particle size fractions d_i/D_i is then sieved using bar sieves which have parallel slots of width $D_i/2$.

The overall flakiness index is calculated as the total mass of particles passing the bar sieves expressed as a percentage of the total dry mass of particles tested.

If required the flakiness index of each particle size fraction d_i/D_i is calculated as the mass of particles passing the corresponding bar sieve, expressed as a percentage by mass of that particle size fraction.

5 Apparatus

All apparatus shall conform to the general requirements of prEN 932-5.

5.1 Test sieves, with square apertures, conforming to EN 933-2 with the following aperture sizes:

80 mm; 63 mm; 50 mm; 40 mm; 31,5 mm; 25 mm; 20 mm; 16 mm; 12,5 mm; 10 mm;
8 mm, 6,3 mm; 5 mm and 4 mm.

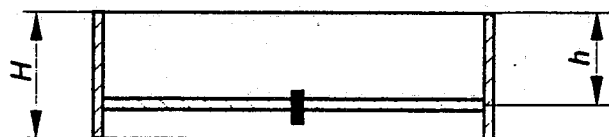
5.2 Corresponding bar sieves, comprising parallel cylindrical bars conforming to figure 1 and the tolerances given in table 1. The tolerances on the width of slot shall apply to the entire length of each slot.

Table 1: Bar sieves

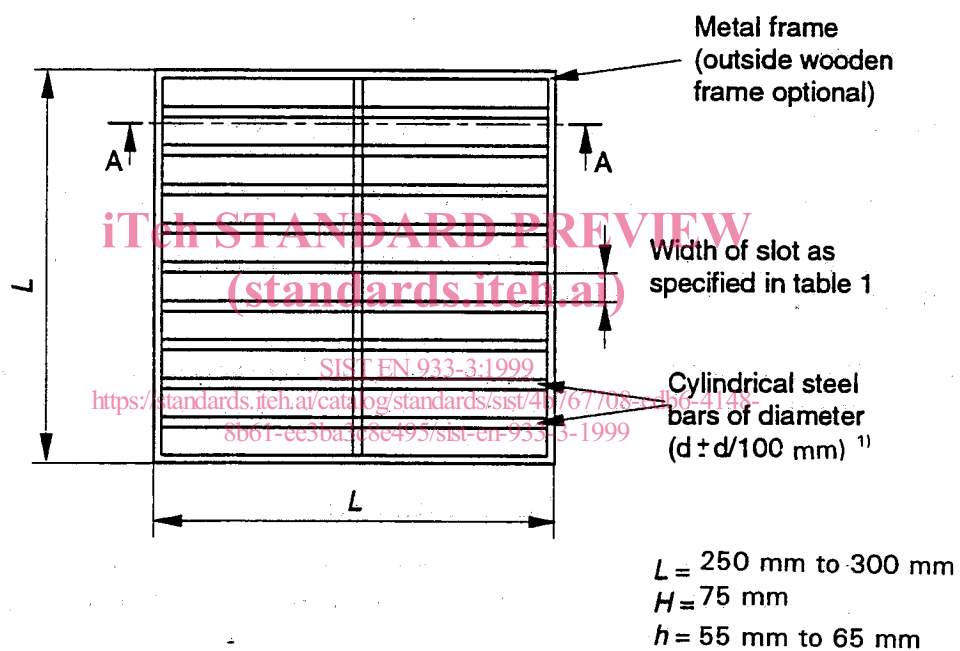
Particle size fraction d_i/D_i mm	Width of slot in bar sieve mm
63/80	40 ± 0,3
50/63	31,5 ± 0,3
40/50	25 ± 0,2
31,5/40	20 ± 0,2
25/31,5	16 ± 0,2
20/25	12,5 ± 0,2
16/20	10 ± 0,1
12,5/16	8 ± 0,1
10/12,5	6,3 ± 0,1
8/10	5 ± 0,1
6,3/8	4 ± 0,1
5/6,3	3,15 ± 0,1
4/5	2,5 ± 0,1

5.3 Balance or scale, accurate to ± 0,1 % of the mass of the test portion.

5.4 Ventilated oven, thermostatically controlled to maintain a temperature of (110 ± 5) °C or other suitable equipment for drying the aggregates, without causing any particle size breakdown.



A - A



¹⁾ Usual diameter range from 5 mm to 15 mm depending on width of slot

Figure 1: Bar sieves

6 Preparation of test portions

Samples shall be taken and reduced in accordance with prEN 932-2.

NOTE: The mass of the test portion depends on the dimensions and the percentage of its largest components.

The mass of the test portion shall be as specified in table 1 of prEN 933-1.

Dry the test portion at $(110 \pm 5) ^\circ\text{C}$ to constant mass. Allow to cool, weigh and record the mass as M_o .

7 Procedure

7.1 Sieving on test sieves

Using the sieves specified in 5.1, sieve the test portion as specified in prEN 933-1.

Weigh and discard all particles passing the 4 mm sieve and retained on the 80 mm sieve.

Weigh and retain separately all the particles in each particle size fraction d_i/D_i between 4 mm and 80 mm.

SIST EN 933-3:1999

7.2 Sieving on bar sieves

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Sieve each particle size fraction d_i/D_i obtained from 7.1 on the corresponding bar sieve given in table 1. This sieving operation shall be carried out manually and shall be considered complete when the retained material does not change by more than 1 % during 1 min of this sieving operation.

Weigh the material from each particle size fraction passing through the corresponding bar sieve.

8 Calculation and expression of results

The results shall be recorded on test data sheets (see example in annex A). Calculate the sum of the masses of the particle size fractions d_i/D_i and record as M_1 .

Calculate the sum of the masses of the particles in each of the particle size fractions d_i/D_i which pass through a corresponding bar sieve of slot width $D_i/2$ and record as M_2 .

The overall flakiness index FI is calculated from the following equation:

$$FI = (M_2/M_1) \times 100 \quad \dots(1)$$

where:

- M_1 is the sum of the masses of the particles in each of the particle size fractions d_i/D_i , in grams;
- M_2 is the sum of the masses of the particles in each particle size fractions passing the corresponding bar sieves of slot width $D_i/2$ in grams.