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Tests for mechanical and physical properties of aggregates - Part 8: Determination of the polished stone value

Prüfverfahren für mechanische und physikalische Eigenschaften von Gesteinskörnungen - Teil 8: Bestimmung des Polierwertes

Essais pour déterminer les caractéristiques mécaniques et physiques des granulats - Partie 8: Détermination du coefficient de polissage accéléré

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This European Standard was approved by CEN on 12 June 2009.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 1097-8:2009) 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of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

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

This document supersedes EN 1097-8:1999.

This standard forms part of a series of tests for mechanical and physical properties of aggregates. Test methods for other properties of aggregates are covered by Parts of the following European Standards:

— EN 932, Tests for general properties of aggregates

— EN 933, Tests for geometrical properties of aggregates

— EN 1367, Tests for thermal and weathering properties of aggregates

— EN 1744, Tests for chemical properties of aggregates

— EN 13179, Tests for filler aggregate used in bituminous mixtures

The other parts of EN 1097 are:

— Part 1: Determination of the resistance to wear (micro-Deval)

— Part 2: Methods for the determination of resistance to fragmentation

— Part 3: Determination of loose bulk density and voids

— Part 4: Determination of the voids of dry compacted filler

— Part 5: Determination of water content by drying in a ventilated oven

— Part 6: Determination of particle density and water absorption

— Part 7: Determination of the particle density of filler — Pyknometer method

— Part 9: Determination of the resistance to wear by abrasion from studded tyres: Nordic test

— Part 10: Determination of water suction height

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Standard describes the reference method used for type testing and in cases of dispute for determining the polished stone value (PSV) of a coarse aggregate used in road surfacings. For other purposes, in particular factory production control, other methods may be used provided that an appropriate working relationship with the reference method has been established.

Annex A describes an optional method for the determination of the aggregate abrasion value (AAV).

NOTE The AAV method should be used when particular types of skid resistant aggregates (typically those with a PSV of 60 or greater) which can be susceptible to abrasion under traffic, are required.

2 Normative references

The following referenced documents are indispensable for the application 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 932-2, *Tests for general properties of aggregates — Part 2: Methods for reducing laboratory samples*

EN 932-5, *Tests for general properties of aggregates — Part 5: Common equipment and calibration*

EN 932-6, *Tests for general properties of aggregates — Part 6: Definitions of repeatability and reproducibility*

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

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

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 4662, *Rubber — Determination of rebound resilience of vulcanizates*

ISO 7619 (all parts), *Rubber, vulcanized thermoplastic — Determination of indentation hardness*

3 Definitions

For the purposes of this document the following definitions apply.

3.1
test specimen
sample used in a single determination when a test method requires more than one determination of a property

3.2
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 With a continuous process the quantity produced during an agreed period is treated as a batch.

3.3
laboratory sample
reduced sample derived from a bulk sample for laboratory testing

3.4
subsample
sample obtained by means of a sample reduction procedure

3.5
test portion
sample used as a whole in a single test

4 Principle

PSV is a measure of the resistance of coarse aggregate to the polishing action of vehicle tyres under conditions similar to those occurring on the surface of a road.

The test is carried out on aggregate passing a 10 mm sieve and retained on a 7,2 mm grid sieve, and is in two parts:

a) test specimens are subjected to a polishing action in an accelerated polishing machine;

b) the state of polish reached by each specimen is measured by means of a friction test. The PSV is then calculated from the friction determinations.

5 Sampling

The sample submitted to the laboratory for the test shall be obtained from a batch of normal production from the source.

Aggregate that has been freshly produced in the laboratory or has been recovered from bituminous mixtures can give misleading results and shall not be used for conformity testing.

6 Materials

6.1 *General*, Detailed requirements for the control of materials are specified in Annex B.

6.2 *Natural corn emery*, complying with the grading specified in Table 1. This shall be used only once.

Table 1 — Grading requirements for corn emery

Nominal width of sieve aperture mm	Total passing %
0,600	98 to 100
0,500	70 to 100
0,425	30 to 90
0,355	0 to 30
0,300	0 to 5

6.3 *Air-floated or water-washed natural emery flour*, all of which passes a 0,050 mm test sieve. This shall be used only once.

NOTE Corundum emery flour with the following characteristics has been found to be suitable:

a) at least 50 % Al_2O_3 content;

b) particle density of at least 3,5 Mg/m^3;

c) particle size distribution (by air jet sieving) as given in Table 2.

Table 2 — Particle size distribution (by air jet sieving)

Sieve size mm	Passing %
0,050	99 to 100
0,032	75 to 98
0,020	60 to 80

6.4 *PSV control stone*, from a recognized source, with a mean PSV value in the range 50 to 60.

NOTE 1 At present the only recognized source of PSV control stone is a stock of quartz dolerite aggregate controlled by Transport Research Laboratory (TRL), Old Wokingham Road, Crowthorne, Berkshire RG11 6AU, United Kingdom.

NOTE 2 An alternative source of PSV control stone with a mean PSV value in the range 50 to 60 can be used provided the PSV value has been established in a controlled experiment carried out in at least 10 laboratories, by cross testing against the TRL type control stone. In case of dispute, the TRL type control stone should be used.

6.5 *Friction tester reference stone*, from a recognized source, for conditioning new sliders and checking the friction tester (11.3), with a mean PSV value in the range 60 to 65.

NOTE 1 At present the only recognized source of friction tester reference stone is a stock of olivine basalt aggregate controlled by the Transport Research Laboratory (TRL), Old Wokingham Road, Crowthorne, Berkshire RG11 6AU, United Kingdom.

NOTE 2 An alternative source of friction tester reference stone with a mean PSV value in the range 60 to 65 can be used provided the PSV value has been established in a controlled experiment carried out in at least 10 laboratories, by cross testing against the TRL type friction tester reference stone. In case of dispute, the TRL type friction tester reference stone should be used.

7 Apparatus

7.1 General

All apparatus, unless otherwise stated, shall conform to the general requirements of EN 932-5. Additional requirements for calibration and control of the accelerated polishing machine and the rubber-tyred wheels are given in Annex C.

7.2 Accelerated polishing machine

The polishing machine, (see Figure 1), shall be mounted on four adjustable levelling feet, placed at the corners and secured on a firm, level base of stone or concrete. It shall include the following:

7.2.1 A wheel, referred to as the "road wheel", having a flat periphery and clamping arrangements to hold the aggregate specimens shown in Figure 2. It shall be of such a size and shape as to permit 14 of the specimens described in Clause 8 to be clamped onto the periphery so as to form a surface of aggregate particles (406 ± 3) mm in diameter and bounded by clamping rings (44,5 ± 0,5) mm apart.

7.2.2 A means of rotating the road wheel about its own axis at a speed of (320 ± 5) min^{-1} under test conditions.

7.2.3 Two solid rubber-tyred wheels of (200 ± 3) mm diameter and with a width of (38 ± 2) mm. These rubber-tyred wheels shall be of two different colours. A dark coloured (coarse) wheel shall be used with the corn emery and a light coloured (fine) wheel shall be used with the emery flour. The rubber tyres shall initially have a hardness of (69 ± 3) IRHD as specified in ISO 7619.

NOTE Both rubber-tyred wheels can be of the same colour provided each is clearly marked as being "coarse" or "fine" as appropriate.

7.2.4 A lever arm and weight to bring the surface of the appropriate solid rubber-tyred wheel to bear on the road wheel with a total free force of (725 ± 10) N. The solid rubber-tyred wheel shall be free to rotate about its own axis, which shall be parallel with the axis of the road wheel, and the plane of rotation of the tyre shall be in line with that of the road wheel.

The machine shall be accurately aligned so that the road wheel and either of the rubber-tyred wheels shall be free to rotate without play in the bearings:

a) the planes of rotation of the two wheels in use shall be not more than 0,33° of arc out of parallel (1 mm in 200 mm);

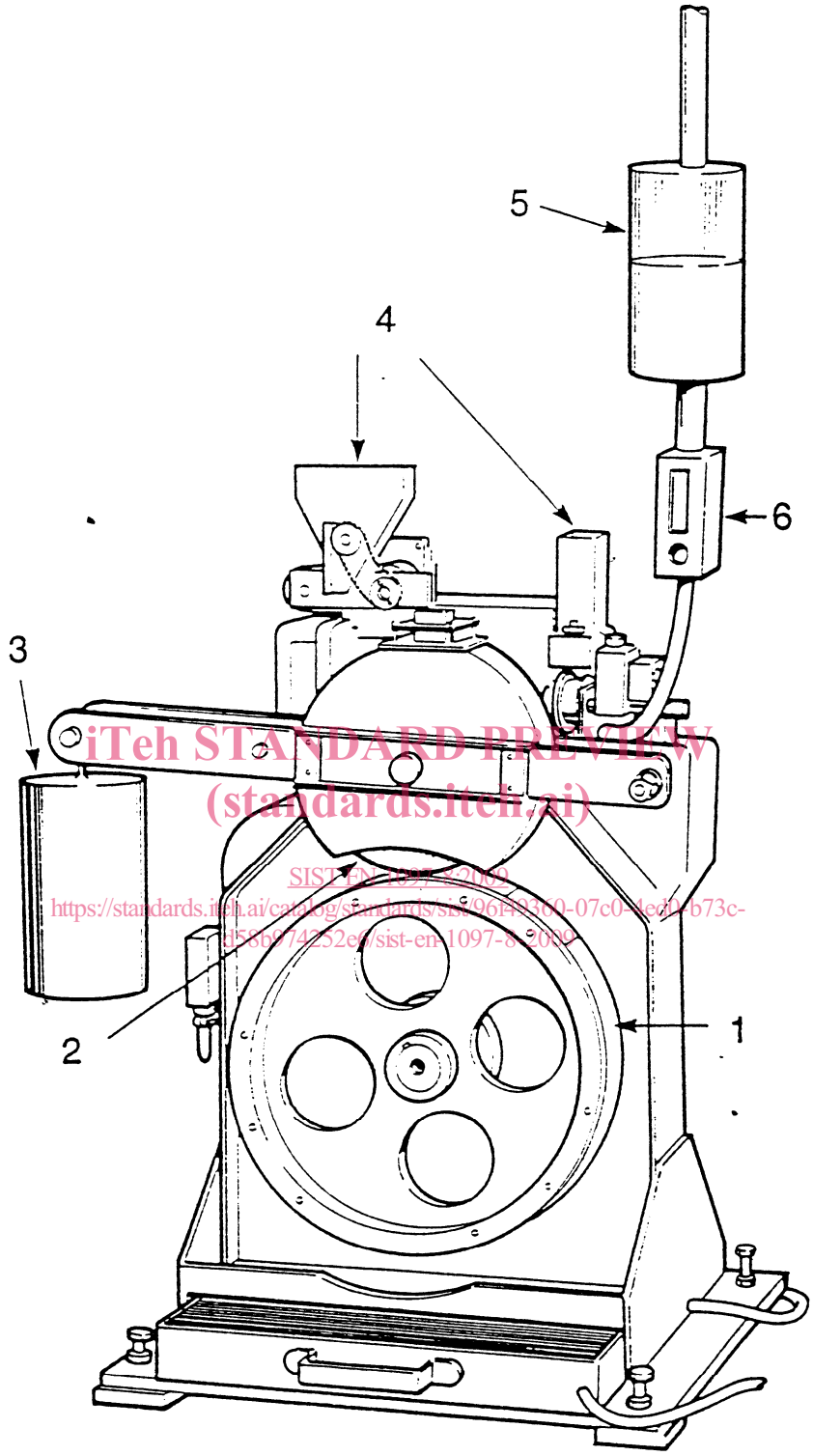
b) the planes of rotation through the centres of the two wheels in use shall be not more than 0,8 mm apart.

7.2.5 Feed mechanism, identified as being for use with the dark coloured (coarse) rubber-tyred wheel to feed the corn emery and water at the specified rates. The emery and water shall be fed directly onto the road wheel near the point of contact with the rubber-tyred wheel.

7.2.6 Feed mechanism, identified as being for use with the light-coloured (fine) rubber-tyred wheel (7.2.3) to feed the emery flour (6.3) and water continuously at the specified rates.

7.2.7 A means of ensuring that the rubber-tyred wheels are not left under load when not running, to prevent the risk of the tyre becoming deformed.

NOTE When not in use, the rubber-tyred wheels should be removed from the machine and stored as described in Annex C.



Key :

1 Road wheel
2 Solid rubber-tyred wheel
3 Weight
4 Feed mechanisms
5 Water feed
6 Flow gauge

Figure 1 — Typical accelerated polishing machine

Dimensions in millimetres

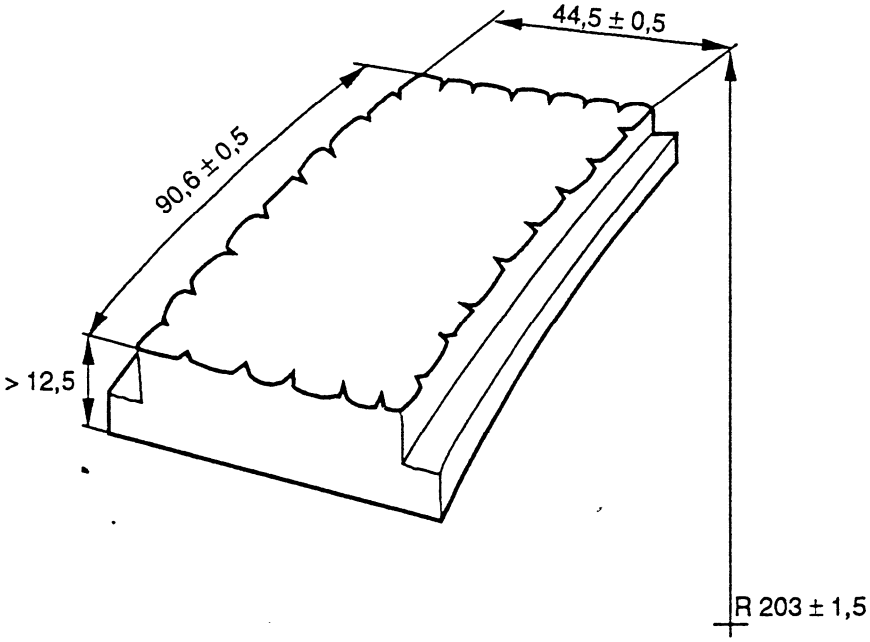


Figure 2 — Test specimen dimensions

7.3 Friction tester

7.3.1 Calibration

Additional requirements for calibration and control of the friction tester, sliders and slider rubber are given in Annex D.

7.3.2 Design

The friction test shall be carried out using the equipment shown in Figure 3 (see Note). All bearings and working parts shall be enclosed as far as possible, and all materials used shall be treated to prevent corrosion under wet conditions.

NOTE The equipment shown in Figure 3 is manufactured to the design of the Transport Research Laboratory (TRL), Old Wokingham Road, Crowthorne, Berkshire RG11 6AU, United Kingdom.

The friction test equipment shall have the following features:

7.3.2.1 A spring-loaded rubber slider of the mass, size and shape as specified in 7.3.2.9. It shall be mounted on the end of a pendulum arm so that the sliding edge is approximately 510 mm from the axis of suspension (11.6).

7.3.2.2 Means for setting the support column of the equipment vertical.

7.3.2.3 Means for rigidly locating one of the curved specimens from the accelerated polishing machine so that its longer dimension lies in the track of the pendulum and it is central with respect to the rubber slider and to the axis of suspension of the pendulum.