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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 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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This European Standard (prEN 1097-8:2018) 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 supersedes EN 1097-8:2009.

The main technical changes compared to prEN 1097-8 June 2016 are the following:

— Notes with normative text are transformed into main text or deleted.

— Figures 3, 6a, 6b, C.2 and D.2.3 are revised.

— In Clause 12, the range for the TUM granite type PSV control stone is revised.

— Annex F is updated as a result of the exchange of PSV control stone.

— The Bibliography is supplemented.

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: Water suction height

In this standard the Annexes A, B, C, D and E are normative and the Annex F is informative.

1 Scope

This European Standard describes the reference method used for type testing and in case 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 are possible provided that an appropriate working relationship with the reference method has been established. Examples of advanced test methods can be found in the Bibliography.

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

NOTE 1 The AAV method is suitable to use 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.

The sample is taken from normal run of production from the plant.

NOTE 2 Chippings that have been freshly crushed in the laboratory or recovered from bituminous materials may give misleading results.

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 932-2, *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 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 7619-2, *Rubber, vulcanized or thermoplastic – Determination of indentation hardness – Part 2: IRHD pocket meter method*

3 Terms and Definitions

For the purposes of this standard the following definitions apply.

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
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 1 to entry: With a continuous process, the quantity produced during an agreed period is treated as a batch.

3.2
laboratory sample
reduced sample derived from a bulk sample for laboratory testing.

3.3
subsample
sample obtained by means of a sample reduction procedure

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

3.5
test specimen
sample used in a single determination when a test method requires more than one determination of a property

4 Principle

PSV is a measure of the resistance of coarse aggregate to the polishing action of vehicle tyres under conditions which simulate 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.

6 Materials

6.1 General

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

6.2 Materials

6.2.1 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** %
1,0	100
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

6.2.2 Air-floated or water-washed natural emery flour, complying with the characteristics specified below. This shall be used only once.

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 — Grading requirements for emery flour

Sieve size mm	**Passing** %
0,063	100
0,050	99 to 100
0,032	75 to 98
0,020	60 to 80

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

NOTE 1 At present the only recognized source of PSV control stone is a stock of granite aggregate controlled by Technische Universität München (TUM), MPA Bau – Abteilung Baustoffe, Baumbachstrasse 7, 81245 München, Germany.

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

In case of dispute, the TUM type control stone should be used.

6.2.4 Friction tester reference stone, from a recognized source, for conditioning new sliders (Annex **E**) and checking the friction tester (**11.3**), with a mean PSV 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 Wessex Precision Instruments, info@wessextestequipment.co.uk.

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

In case of dispute, the WESSEX 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 (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:

— 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.

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

— Two solid rubber-tyred wheels of (200 ± 3) mm diameter and with a width of (38 ± 2) mm. One of these wheels shall be used exclusively with the corn emery and clearly marked as such, whereas the other wheel shall be used exclusively with the emery flour and clearly marked as such. The surface of the rubber tyres shall initially have a hardness of (69 ± 3) IRHD as specified in ISO 7619-2.

— 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.

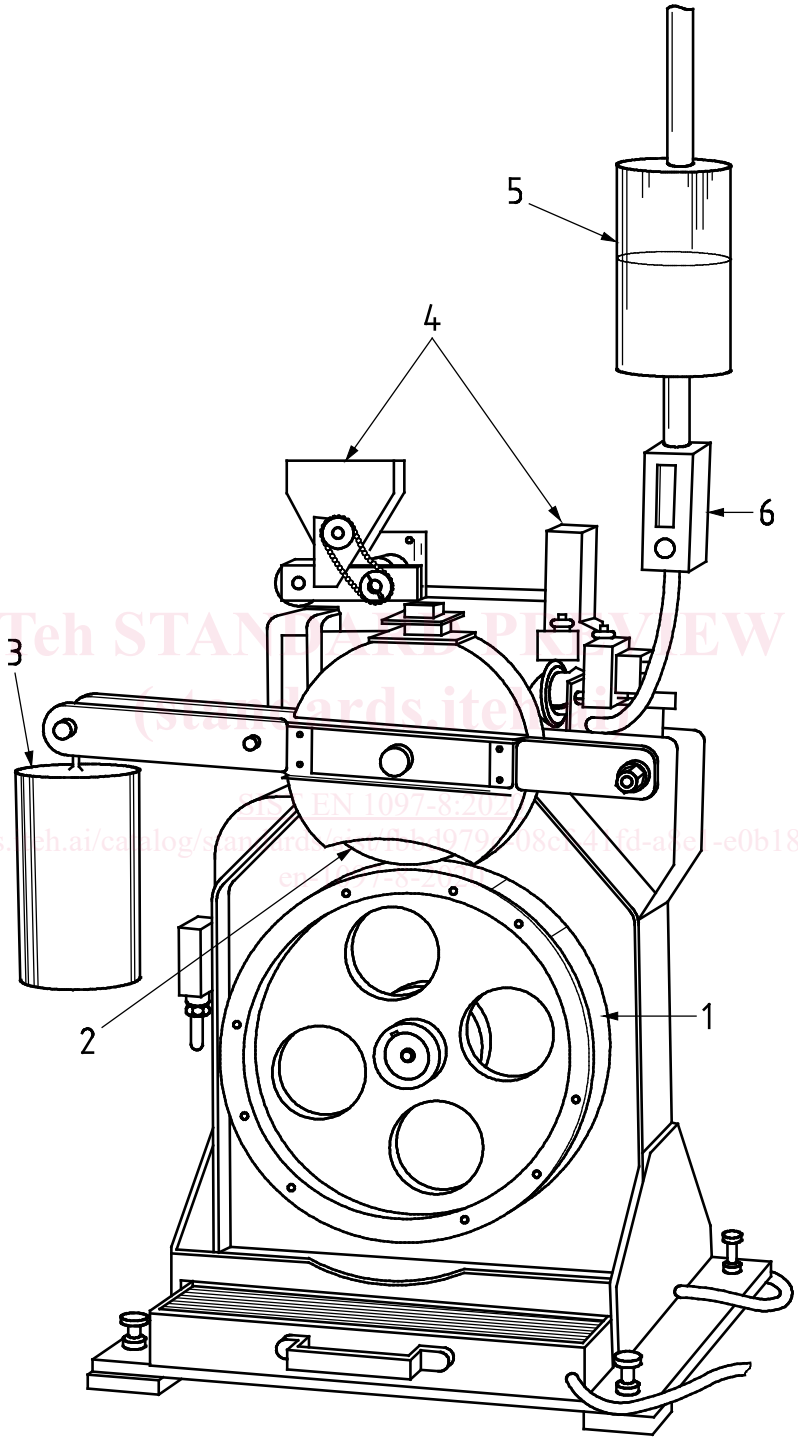
  The machine shall be accurately aligned so that the road wheel and either of the rubber-tyred wheels shall be free to rotate without play in the bearings (**C.2.4**):

  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.

— Feed mechanism, identified as being for use with the rubber-tyred wheel marked for use with the corn emery (**7.2.3**), to feed the corn emery (**6.2**) 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.

NOTE Feeding the corn emery and water near the point of contact with the rubber-tyred wheel is usually achieved using a nozzle into which water and emery mix. In such a case, instead of having a continuous emery flow, emery clusters may form under capillary forces and discharge discontinuously near the point of contact with the rubber-tyred wheel. To avoid this phenomenon, a possible solution would be to connect the water supply to the lowest point of the nozzle (close to the road wheel).



Key

1 road wheel	4 feed mechanisms
2 solid rubber-tyred wheel	5 water feed
3 weight	6 flow gauge

Figure 1 – Typical accelerated polishing machine

Dimensions in millimetres

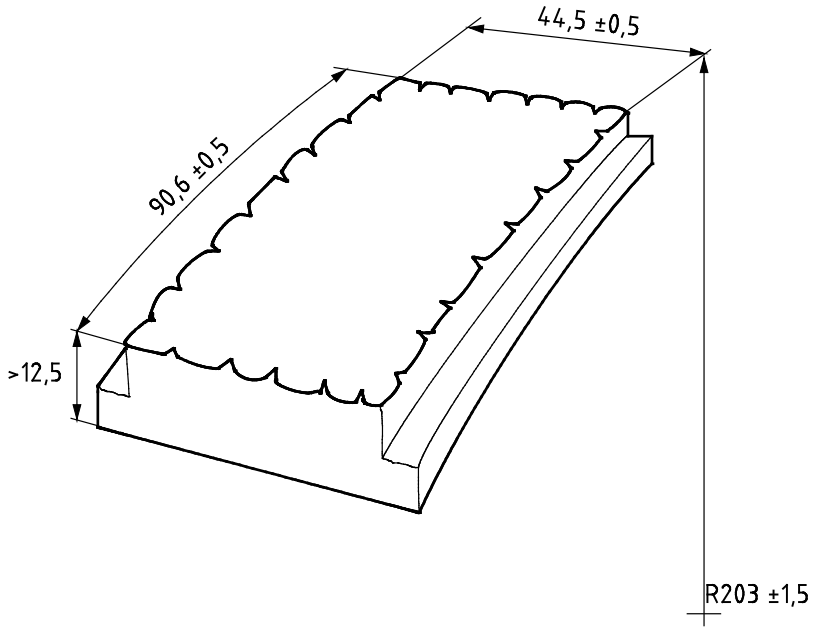


Figure 2 — Test specimen dimensions

— Feed mechanism, identified as being for use with rubber-tyred wheel marked for the emery flour (**7.2.3**), to feed the emery flour (**6.3**) and water continuously at the specified rates between the rubber tyred-wheel and the road wheel.

Most feed mechanisms inject emery flour at the top of the rubber-tyred wheel and not at the contact point with the road wheel. In this case, it is important to ensure that most emery is driven to the contact point between the road wheel and the rubber-tyred wheel. For this purpose, some feed mechanisms incorporate a disposable felt pad in contact with the rubber-tyred wheel to homogeneously spread and stick the emery flour onto its tread. It is recommended to change this felt pad every two tests.

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

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**. 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.