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BSI Standards Publication

Tests for mechanical and physical properties of aggregates

Part 6: Determination of particle density and water absorption

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National foreword

This British Standard is the UK implementation of EN 1097-6:2022. It supersedes BS EN 1097-6:2013, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/502/6, Test methods.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Tests for mechanical and physical properties of aggregates - Part 6: Determination of particle density and water absorption

Essais pour déterminer les caractéristiques
mécaniques et physiques des granulats - Partie 6 :
Détermination de la masse volumique et du coefficient
d'absorption d'eau

Prüfverfahren für mechanische und physikalische
Eigenschaften von Gesteinskörnungen - Teil 6:
Bestimmung der Korndichte und der Wasseraufnahme

This European Standard was approved by CEN on 12 December 2021.

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European foreword

This document (EN 1097-6:2022) has been prepared by Technical Committee CEN/TC 154 "Aggregates", the secretariat of which is held by BSI.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2022, and conflicting national standards shall be withdrawn at the latest by August 2022.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 1097-6:2013.

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

- a) Normative references has been extended with EN 1097-5 (used in Annex D). EN 932-1 has been deleted from the clause since sampling is out of the scope, as for other standards;
- b) the definitions of laboratory sample and subsample have been added in Clause 3;
- c) the glass funnel in 6.4.4 has been deleted since it is part of the pyknometer in 6.5.1. The minimum volume of the pyknometer in 6.5.1 has been changed from 250 ml to 500 ml. New 6.8 and 6.10 have been added and describe special apparatus referenced in new Annexes D and F;
- d) Clause 9 has been extended with an illustration of the surface-dry state assessment using the cone test;
- e) the possibility to remove air from the pyknometer by applying a vacuum has been added in A.4.3;
- f) in Annex B, the test portion mass for single aggregates (B.2.2) and the temperature requirement in B.3 have been clarified. In addition, the time needed for achieving constant mass during suction has been clarified;
- g) the Note in C.1 has been revised to say that the method can also be used for aggregate particles passing the 4 mm sieve and retained on the 1 mm sieve. Soaking times for the water absorption determination have been added in C.1. A new paragraph has been added in C.1, saying that for concrete applications the water absorption of coarse lightweight aggregate shall be determined in the as-used moisture state instead of the oven-dry state. In C.4, a Note about using vibrating table as a vibration means has been added. Precision of individual values has been defined in C.5;
- h) a new normative Annex D has been designed to determine the particle density and water absorption of fine lightweight aggregates. Consequently, Annex C has been retitled to only apply to coarse lightweight aggregates;
- i) the title of Annex E has been shortened. The Note in E.1 has been revised to say that the method can also be used for aggregate particles passing the 2 mm sieve and retained on the 1 mm sieve. Precision of individual values has been defined in E.4;
- j) Annex F has been replaced by a new informative annex designed to determine the particle density and water absorption of aggregates passing the 4 mm sieve;

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- k) the procedure in Annex H has been extended to specify double determination. In addition, the recommended volume which the test portion should occupy to enable the release of entrapped air, has been changed from one third to one half of the pycnometer volume, in consistency with other clauses;
- l) all annexes have been reordered to collect the annexes about lightweight aggregates. Annex D Density of water has been moved to Annex G and Annex J List of main changes has been deleted.

Furthermore, the whole standard has been updated according to the current rules and to reflect the changes. The text has been clarified and the Bibliography has been supplemented.

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

- EN 932 (all parts), *Tests for general properties of aggregates*
- EN 933 (all parts), *Tests for geometrical 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 1097 include:

- *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 the water content by drying in a ventilated oven*
- *Part 7: Determination of the particle density of filler — Pycnometer method*
- *Part 8: Determination of the polished stone value*
- *Part 9: Determination of the resistance to wear by abrasion from studded tyres — Nordic test*
- *Part 10: Determination of water suction height*

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.

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1 Scope

This document specifies the reference methods used for type testing and in case of dispute, for the determination of particle density and water absorption of normal weight and lightweight aggregates. Other methods can be used for other purposes, such as factory production control, provided that an appropriate working relationship with the reference method has been established. For convenience, some of these other methods are also described in this document.

The reference methods for normal weight aggregates are:

- a wire basket method for aggregate particles retained on the 31,5 mm sieve (Clause 7, except for railway ballast which uses Annex B);
- a pyknometer method for aggregate particles passing the 31,5 mm sieve and retained on the 4 mm sieve (Clause 8);
- a pyknometer method for aggregate particles passing the 4 mm sieve and retained on the 0,063 mm sieve (Clause 9).

In Clauses 7, 8 and 9, three different particle densities (oven-dried particle density, saturated and surface-dried particle density and apparent particle density) and water absorption are determined after a soaking period of 24 h. In Annex B, the oven-dried particle density is determined after soaking in water to constant mass.

For aggregate particles passing the 31,5 mm sieve and retained on the 4 mm sieve, the wire basket method in Clause 7 can be used as an alternative to the pyknometer method in Clause 8.

NOTE 1 The wire basket method can also be used for single aggregate particles retained on the 63 mm sieve.

NOTE 2 The pyknometer method described in Clause 8 can be used as an alternative for aggregates passing the 4 mm sieve and retained on the 2 mm sieve.

The reference methods for lightweight aggregates are:

- a pyknometer method for aggregate particles passing the 31,5 mm sieve and retained on the 4 mm sieve (Annex C). Three different particle densities (oven-dried; saturated and surface-dried; apparent) and water absorption are determined after pre-drying and a soaking period of 24 h;
- a method, using a Büchner funnel, for aggregate particles passing the 4 mm sieve (Annex D). The three particle densities and water absorption are determined using a vacuum in the range of 50 mbar to 100 mbar for at least five minutes.

Three other methods for normal weight aggregates can be used to determine the pre-dried particle density, as specified in normative Annexes A and H:

- a wire basket method for aggregate particles passing the 63 mm sieve and retained on the 31,5 mm sieve (A.3);
- a pyknometer method for aggregate particles passing the 31,5 mm sieve and retained on the 0,063 mm sieve (A.4);
- a pyknometer method for aggregate particles passing the 31,5 mm sieve, including the 0/0,063 mm size fraction (Annex H).

NOTE 3 If water absorption is less than about 1,5 %, the apparent particle density can be assessed using the pre-dried particle density method as defined in Annex A.