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Preskusi mehanskih in fizikalnih lastnosti agregatov - 10. del: Določevanje kapilarnega dviga vode

Tests for mechanical and physical properties of aggregates - Part 10: Determination of water suction height

Prühfverfahren für mechanische und physikalische Eigenschaften von Gesteinskörnungen - Teil 10: Bestimmung der Wassersaughöhe

Essais pour déterminer les caractéristiques mécaniques et physiques des granulats - Partie 10 : Hauteur de succion d'eau

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EUROPEAN STANDARD

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Tests for mechanical and physical properties of aggregates - Part 10: Determination of water suction height

Essais pour déterminer les caractéristiques mécaniques et physiques des granulats - Partie 10: Hauteur de succion d'eau

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This European Standard was approved by CEN on 24 February 2014.

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 CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 1097-10:2014) 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of an identical text or by endorsement, at the latest by October 2014 and conflicting national standards shall be withdrawn at the latest by October 2014.

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 1097-10:2002.

This European Standard forms part of a series of tests for mechanical and physical properties of aggregates. Test methods for other properties of aggregates will be 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 the 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 8: Determination of the polished stone value*

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

— *Part 11: Determination of compressibility and confined compressive strength of lightweight aggregates*

The technical changes between this edition and the 2002 version are as follows:

a) 6.3 and 6.4, minimum size of vessel and moisture container have been reduced;

b) 6.13, tolerance on temperature stability has been broaden;

c) Clause 7, Table 2, minimum volume of test portion has been reduced;

d) 8.4, Figure 2 has been redrawn and clarified;

e) 8.2 to 8.4, units have been updated;

f) Definition of constant moisture content has been clarified and appended to 8.4.

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

1 Scope

This European Standard specifies the reference method, used for type testing and in case of dispute, for determining the water suction height of an aggregate in direct contact with a free water surface. For other purposes, in particular production control, other methods may be used, provided that an appropriate working relationship with the reference methods has been established.

NOTE Capillary water uptake in an aggregate layer under the ground floor may cause moisture problems in the building. If the layer is thicker than the water suction height of the aggregate used, the layer is considered as a capillary barrier.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 1097-5, *Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
water suction height
level to which the water raises in a layer of aggregate in direct contact with a free water surface

3.2
maximal hygroscopic moisture content
moisture content of aggregates in a sealed container just below 100 % relative humidity

3.3
aggregate size
designation of aggregate in terms of lower (*d*) and upper (*D*) sieve sizes

Note 1 to entry: This designation accepts the presence of some particles which will be retained on the upper sieve (oversize) and some which will pass the lower sieve (undersize).

3.4
constant mass
mass determined after successive weighings at least 1 h apart not differing by more than 0,1 %

Note 1 to entry: In many cases constant mass can be achieved after a test portion has been dried for a pre-determined period in a specified oven 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.

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

4 Principle

A test portion of dry aggregate in a vertical tube is brought into direct contact with a free water surface, allowing the aggregate to take up water by suction. When equilibrium is reached, the water suction height is determined from the moisture content variation within the test portion.

NOTE 1 The water suction height may be affected by the relative humidity. For this reason, the hygroscopic moisture content is simultaneously determined and the largest effect is recorded as the water suction height.

NOTE 2 The water suction height may be affected by the compacted dry bulk density. For this reason, the compacted dry bulk density is determined and recorded.

5 Materials

5.1 Water, boiled and cooled before use

NOTE Fresh tap water and demineralized water are both suitable as long as they are free from any impurity.

5.2 Reagents

Saturated potassium sulfate solution, prepared by dissolving (12 ± 1) g of reagent grade potassium sulfate by stirring in (100 ± 1) g of demineralized water at (40 ± 1) °C. Allow the solution to cool to room temperature and store in a closed bottle.

NOTE The potassium sulfate solution is used to avoid condensation while determining the maximal hygroscopic moisture content (6.4), as water drops from the condensation may soak the test sample.

6 Apparatus

6.1 All apparatus, unless otherwise stated, shall conform to the general requirements of EN 932-5.

6.2 Tube, made of transparent material with a height of not less than 200 mm and a diameter as specified in Table 1.

NOTE Aggregates with a large value of water suction height may require a longer tube.

The lower end of the tube wall shall be fitted with at least four slots, ensuring free movement of water into the tube. An example of slot design is shown in Figure 1. The tube shall be glued in the centre of the vessel (6.3). Take care not to clog the slots. The width of the slots should be smaller than *d* to prevent particles to flow into the vessel.

6.3 Vessel, made of transparent material. The internal bottom area of the vessel shall be large enough to have a minimum distance of 50 mm between the edge of the vessel and the wall of the tube. The vessel is fitted with a needle made of non-corrosive material, to indicate a water level (10 ± 1) mm above the base of the vessel, as shown in Figure 1.

6.4 Moisture container and close fitting lid, made preferably of transparent material, with an internal bottom area as specified in Table 1 and an internal depth of at least 60 mm. The container is fitted with a heat insulated cover or placed inside the test cabinet (see 6.13).

NOTE Vessels and containers can be circular or rectangular.

Table 1 — Minimum dimensions of tube and moisture container

Upper aggregate size *D* mm	Minimum internal diameter of tube [a] mm	Minimum internal bottom area of moisture container [b] m^2
8	125	0,04
10	125	0,04
16	140	0,04
20	140	0,05
32	170	0,08
[a] See 6.2. [b] See 6.4.		

6.5 Glass basin, flat bottom crystallising type of 150 ml nominal capacity, to contain the potassium sulfate solution (see 5.2).

6.6 Balance, with an accuracy of 0,1 g for masses of 100 g or more and an accuracy of 0,01 g for masses of less than 100 g.

6.7 Plastic bag and rubber band, size appropriate to the diameter of the tube.

6.8 Wood stick (wooden dowel), with a diameter of approximately 0,25 X the diameter of the tube and a height of approximately 500 mm, for packing of the material in the tube.

6.9 Plastic water bottle with spout, for water supply and level adjustment.

6.10 Ventilated oven, thermostatically controlled to maintain a temperature of (110 ± 5) °C.

6.11 Steel straight edge, for levelling the surface of the aggregate with the top of the tube.

6.12 Adhesive tape, to seal the moisture container.

6.13 Test cabinet, or similar controlled environment capable of maintaining a stable temperature (± 2,0 °C) between 20,0 °C and 25,0 °C.