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

Prüfverfahren 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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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

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

This European Standard was approved by CEN on 7 November 2002.

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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 Management Centre has the same status as the official versions.

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

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Foreword

This document (EN 1097-10:2002) 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of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2004.

This 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

This standard includes a Bibliography.

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

1 Scope

This European Standard specifies a procedure for determining the water suction height of an aggregate in direct contact with a free water surface.

NOTE Rise of moisture through 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 water breaking layer.

2 Normative references

This European Standard incorporates by dated or 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 (including amendments).

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 European Standard, the following terms and definitions apply.

3.1
water suction height
level to which the water is raised by an aggregate in direct contact with a free water surface

3.2
hygroscopic water absorbing capacity
moisture content of aggregates in a sealed container at 97 % relative humidity

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

NOTE 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
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 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

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 by measuring the variation in moisture content within test portion.

5 Apparatus

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

5.2 Tube, made of transparent material with a height of not less than 200 mm and a diameter as specified in Table 1. The lower end of the tube is fitted with at least four slots (2 ± 1) mm wide and (5 ± 1) mm long, as shown in Figure 1.

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

Table 1 — Minimum tube, container and vessel sizes

Upper aggregate size *D* mm	Minimum internal diameter of tube [a] mm	Minimum internal surface area of vessel or moisture container [b] [c] m^2
8	125	0,325 ± 0,025
10	125	0,325 ± 0,025
16	140	0,325 ± 0,025
20	170	0,65 ± 0,05
32	280	1,15 ± 0,15

[a] See 5.2
[b] See 5.3
[c] See 5.4

5.3 Vessel, made of transparent material, with an internal surface area as specified in Table 1. 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.

5.4 Moisture container and close fitting lid, made of transparent material, with an internal surface area as specified in Table 1 and an internal depth of at least 60 mm. The container is fitted with a heat insulated cover.

NOTE Vessels and containers can be circular or rectangular.

5.5 Glass basin, flat bottom crystallising type of 150 ml nominal capacity, to contain the potassium sulfate solution (see 6).

5.6 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.

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

5.8 Wood stick (wooden dowel), with a diameter of (0,25 ± 0,05) times the diameter of the tube and a height of (500 ± 25) mm, for packing of the material in the tube.

5.9 Plastic water bottle with spout, for water level adjustment, and a supply of deionised water.

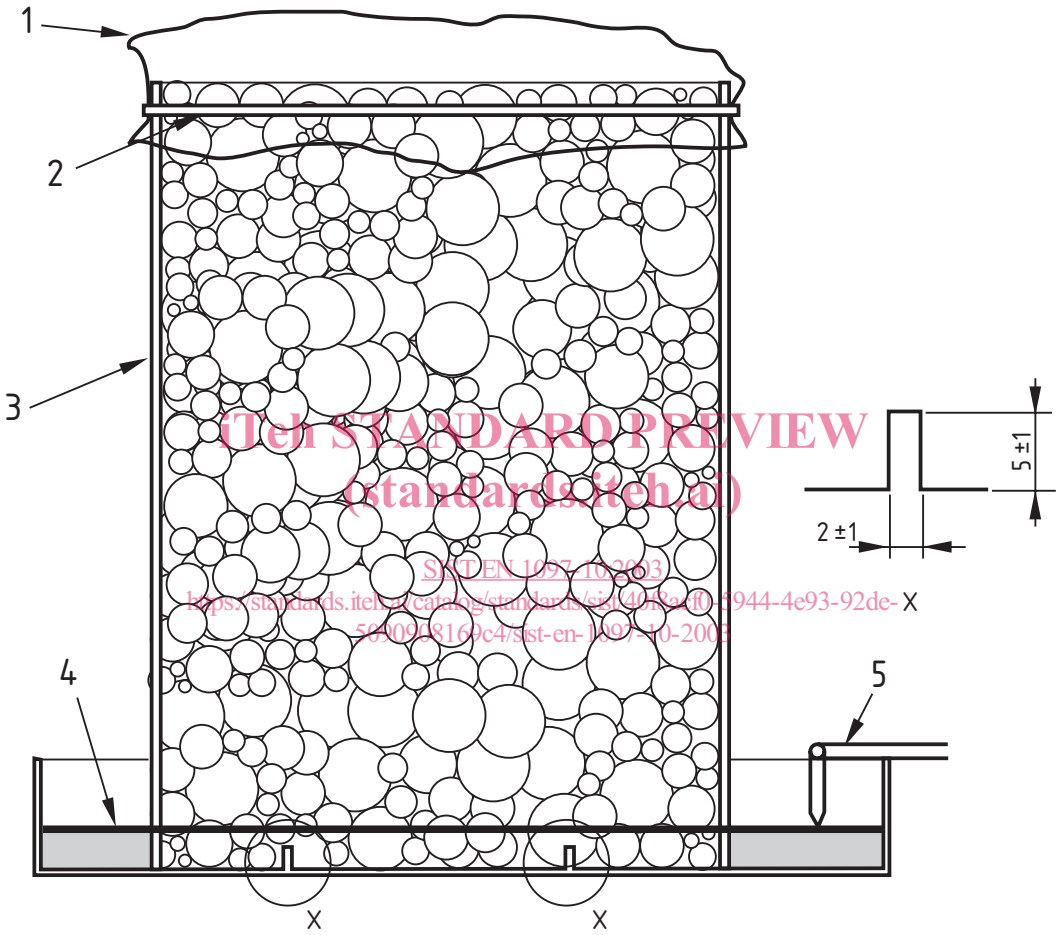
5.10 Ventilated drying oven, thermostatically controlled to maintain a temperature of (110 ± 5) °C.

5.11 Steel straight edge, for striking off the top level aggregate.

5.12 Adhesive tape, to seal the moisture container.

5.13 Test cabinet, or similar controlled environment capable of maintaining a stable temperature between 20,0 °C and 25,0°C. The chosen temperature shall be maintained at a stability of (± 1,0°C).

Dimensions in millimetres



Key

1 Plastic bag
2 Rubber band
3 Tube
4 Water surface
5 Level needle

Figure 1 — Tube and vessel for determination of capillary water suction height

6 Reagents

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

7 Preparation of test portions

Reduce the size of laboratory sample using the procedures specified in EN 932-2 to produce two test portions, one for determination of hygroscopic water absorption (8.2) and one for determination of suction height (8.4), of the minimum volume specified in Table 2.

Dry the two test portions of aggregate to constant mass as specified in EN 1097-5.

Table 2 — Minimum test portion volumes

Upper aggregate size *D* mm	Minimum test portion volume *l*	
	Determination of hygroscopic water absorbing capacity [a]	Determination of packed dry density and water suction height [b]
8	0,25	3,0
10	0,25	3,0
16	0,25	4,0
20	0,5	5,0
32	2,0	14,0

[a] See 8.2
[b] See 8.3 and 8.4

8 Test procedure

8.1 General

Carry out the test in the test cabinet maintained at the selected stable temperature defined in 5.13.

NOTE To prevent condensation on the inner surface of the tube and container, the apparatus should be shielded from cold walls, cold windows, direct sunlight and draughts.

8.2 Determination of hygroscopic water absorbing capacity

Place the glass basin containing the prepared saturated potassium sulfate solution in the centre of the moisture container. Distribute the test portion evenly around the remaining area of the moisture container. Fit the cover and seal the cover to the container with adhesive tape.

When the determination of water suction height (8.4) is complete, separate the moisture container and weigh the sample (M_{hyg}). Determine the dry mass of the test portion (M_{hygt}), as specified in EN 1097-5.

Calculate the amount of water absorbed in accordance with the following equation:

$$W_{hyg} = \frac{M_{hyg} - M_{hygt}}{M_{hygt}} \times 100$$

where: