

BS 1881-122:2011



BSI Standards Publication

## Testing concrete

Part 122: Method for determination  
of water absorption

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## Contents

Foreword *iii*

1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Apparatus	1
5	Test specimens	2
6	Procedure	3
7	Calculation and expression of results	3
8	Test report	4

Bibliography 5

### List of figures

Figure 1 – Correction factor 4

### Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 6, an inside back cover and a back cover.

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## Foreword

### Publishing information

This Part of BS 1881 was published by BSI and came into effect on 31 July 2011. It was prepared by Subcommittee B/517/1/30, *Concrete production and testing*, under the authority of Technical Committee B/517, *Concrete and related products*. A list of organizations represented on these committees can be obtained on request to their secretary.

### Supersession

This part of BS 1881 supersedes BS 1881-122:1983, which is withdrawn.

### Relationship with other publications

BS 1881 contains test methods for concrete currently used in the United Kingdom which are not covered by BS EN 12350, BS EN 12390 or BS EN 12504. Reference is made to the relevant part of BS EN 12350, BS EN 12390 and BS EN 12504 where appropriate. These test methods may be used in conjunction with BS EN 206-1.

BS 1881 is published in the following parts:

- Part 113, *Method for making and curing no-fines cubes*;
- Part 119, *Method for determination of compressive strength using portions of beams broken in flexure (equivalent cube method)*;
- Part 122, *Method for determination of water absorption*;
- Part 124, *Methods for analysis of hardened concrete*;
- Part 125, *Method for mixing and sampling fresh concrete in the laboratory*;
- Part 128, *Method for analysis of fresh concrete*;
- Part 129, *Method for the determination of density of partially compacted semi-dry fresh concrete*;
- Part 204, *Recommendations on the use of electromagnetic covermeters*;
- Part 206, *Recommendations for determination of strain in concrete*;
- Part 207, *Recommendations for the assessment of concrete strength by near-to-surface tests*;
- Part 208, *Recommendations for the initial surface absorption of concrete*;
- Part 209, *Recommendations for the measurement of dynamic modulus of elasticity of concrete*; and
- DD 216, *Method for the determination of chloride content of fresh concrete*.

### Information about this document

This is a full revision of the standard for determination of water absorption into cores and has been extended to cover the testing of cast specimens.

BS ISO 5725-2 gives further information on the determination of repeatability and reproducibility.

## Hazard warnings

**CAUTION** When cement is mixed with water, alkali is released. Take precautions to avoid dry cement entering the eyes, mouth and nose whilst mixing concrete. Prevent skin contact with wet cement or concrete by wearing suitable protective clothing. If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately.

## Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

## Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

## Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

## 1 Scope

This Part of BS 1881 specifies a method for the determination of water absorption of concrete specimens cored from a structure or a precast component.

The method may also be used to determine the water absorption of concrete cast into prisms or cylinders where the surface to volume ratio can be calculated and where no point in the specimen is more than 50 mm from a free surface.

The measured water absorption of the specimen is corrected to that equivalent to a surface to volume ratio of a core 75 mm long with a diameter of 75 mm.

*NOTE* Absorption values for cast specimens are normally slightly lower than those for a core from the same concrete but the difference can be more significant if the aggregate is absorbent.

## 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.

BS 8500-1 *Concrete – Complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance for the specifier*

BS 8500-2 *Concrete – Complementary British Standard to BS EN 206-1 – Part 2: Specification for constituent materials and concrete*

BS EN 206-1, *Concrete – Part 1: Specification, performance, production and conformity*

BS EN 12390-1, *Testing hardened concrete – Part 1: Shape, dimensions and other requirements for specimens and moulds*

BS EN 12390-2, *Testing hardened concrete – Part 2: Making and curing specimens for strength tests*

BS EN 12390-7, *Testing hardened concrete – Part 7: Density of hardened concrete*

BS EN 12504-1, *Testing concrete in structures – Part 1: Cored specimens – Taking, examining and testing in compression*

## 3 Terms and definitions

For the purposes of this Part of this British Standard the definitions given in BS 8500-1, BS 8500-2 and BS EN 206-1 apply.

## 4 Apparatus

**4.1 Balance**, capable of weighing specimens up to 5 kg to an accuracy of 0.001 kg. It shall be calibrated on first use and at least annually thereafter, using weights of which the accuracy can be traced to the national standard of mass and shall be checked after relocation or disturbance. A certificate stating the accuracy shall be obtained from the organization carrying out the check.

**4.2 Coring machine**, with a cylindrical bit having an impregnated or set diamond cutting edge for cutting a 75mm  $\pm$ 3 mm diameter core.

**4.3 Ventilated drying oven**, controlled to maintain a temperature of 105 °C  $\pm$ 5 °C, and such that the specimens can be placed in the oven as described in 6.1.

**4.4 Curing tank**, at least 125 mm deep, containing water from a potable supply maintained at a temperature of  $20\text{ °C} \pm 2\text{ °C}$ .

**4.5 Dry airtight vessel**, (e.g. desiccator) of sufficient size to take the set of three specimens to be tested.

**4.6 Cubes or cylinders**, when used, conforming to BS EN 12390-1. Cube sides shall not exceed 100 mm and cylinders shall not have a diameter exceeding 100 mm.

## 5 Test specimens

### 5.1 Cored specimens

Cores shall be taken according to BS EN 12504-1.

To ensure the sample is representative, a set of three specimens shall be obtained by coring from the full thickness of the concrete when this is between 32 mm and 150 mm, or by obtaining a core 75 mm long when the thickness of the specimen is greater than 150 mm. The diameter of each core shall be  $75\text{ mm} \pm 3\text{ mm}$ .

Each core shall be marked clearly with its identification mark in indelible ink immediately after cutting, and the orientation of each core shall be determined. Cores that have been broken out of larger samples shall have the broken ends trimmed approximately square with the axis.

*NOTE One end of each specimen should preferably be from one of the faces which would normally be exposed when the unit is in use.*

### 5.2 Cast specimens

To ensure the sample is representative, at least three cubes or cylinders shall be prepared from fresh concrete in accordance with BS EN 12390-2. Particular care shall be taken to keep the use of mould release compounds to a minimum.

*NOTE Preferably mould release compounds should not be used at all.*

When it is necessary to use a mould release agent, the surface shall be rinsed with clean water immediately after demoulding, then it shall be brushed with a weak detergent solution followed by a final water rinse to remove any residual release agent.

If there is any indication of surface staining, a water repellent surface or retardation of the cement paste resulting from the use of mould oils, the specimen shall be rejected.

After demoulding and cleaning, the specimens shall be stored in a curing tank kept at  $20\text{ °C} \pm 2\text{ °C}$  until required for testing.

### 5.3 Measurement of density

The density of the specimens shall be measured in accordance with BS EN 12390-7. Use the saturated procedure for cast specimens. Use either the as-received or saturated procedure for cored specimens.

### 5.4 Measurement of dimensions

The dimensions of the specimen shall be measured in accordance with BS EN 12390-1.

## 5.5 Age of specimens at test

Unless specified otherwise, the test for absorption shall be made when the age of the concrete is 28 days to 32 days. Therefore the drying of the specimens shall begin at an age of 24 days to 28 days.

*NOTE* If the absorption test is carried out on concrete less than 28 days old an appreciably higher value might be obtained. Conversely, the absorption at ages greater than 28 days might be appreciably less. These variations are dependent, amongst other factors, on the rate of hydration of the cement.

## 6 Procedure

6.1 Place the three specimens in the drying oven (4.3) not less than 25 mm from any heating surface or from each other, and so that air can access all their surfaces. Do not place further specimens in the oven once the drying process has begun.

6.2 Dry the specimens in the oven for 72 h  $\pm$  2 h.

6.3 On removal from the oven (4.2), cool each specimen for 24 h  $\pm$  0.5 h in the dry airtight vessel (4.5).

6.4 Weigh and record the mass of each specimen immediately after cooling.

6.5 Completely immerse each specimen in the tank (4.4) with its longitudinal axis horizontal and at a depth at which there is 25 mm  $\pm$  5 mm of water above top of the specimen.

6.6 Immerse the specimens in the water for 30 min  $\pm$  0.5 min, unless otherwise specified.

6.7 Upon removal of each specimen, shake it to remove the bulk of the surface water and dry it with a cloth as rapidly as possible until all free water is removed from the surface.

6.8 Weigh each specimen and record its mass.

*NOTE* Where the effectiveness of water resisting admixtures or pore blockers are being established, the water absorption rate should be obtained using the following cumulative immersion periods: 10, 30, 60, 120 min, unless otherwise specified, with the same specimens being used and returned to the tank after each measurement.

## 7 Calculation and expression of results

The measured absorption of each specimen shall be calculated as the increase in mass resulting from immersion expressed as a percentage of the mass of the dry specimen.

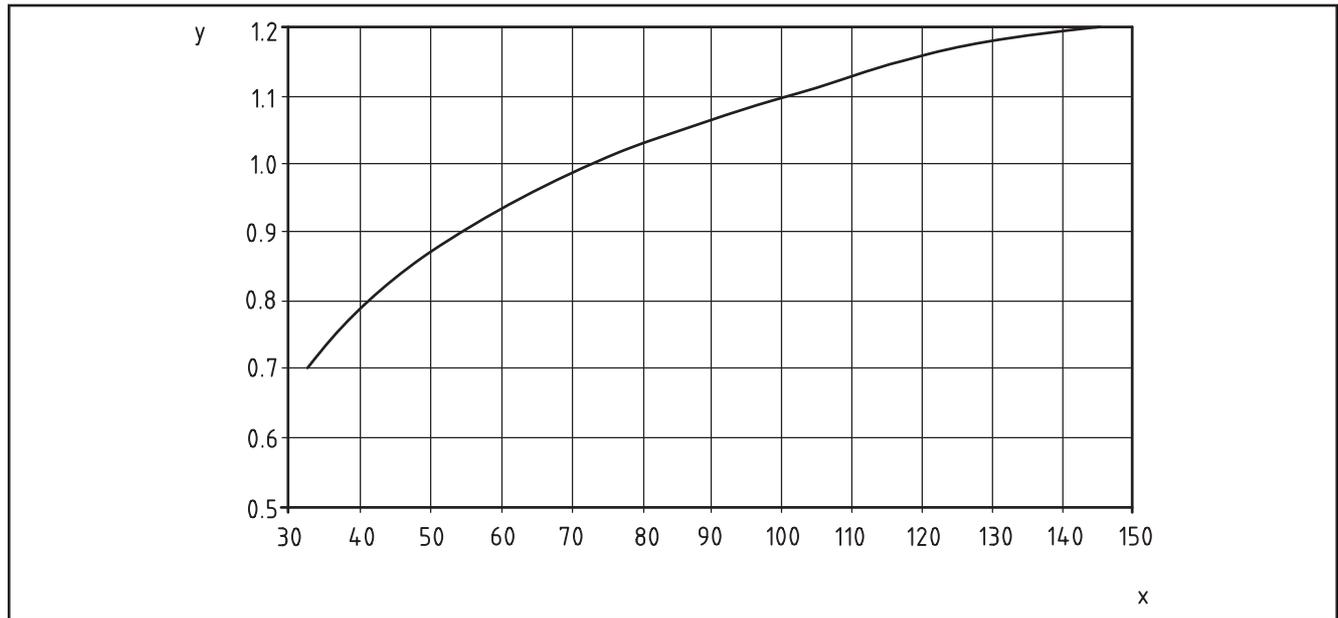
A correction factor according to the surface to volume ratio of the specimen shall be obtained using the formula:

$$\text{correction factor} = \frac{\text{volume (mm}^3\text{)}}{\text{surface area (mm}^2\text{)} \times 12.5}$$

In the case of cores with a diameter of 75 mm  $\pm$  3 mm the correction factor shall be obtained from the curve shown in Figure 1 according to the length of the specimen.

The product of this correction factor and the measured absorption shall be known as the 'corrected absorption', this being the equivalent absorption of a core of 75 mm diameter with a length of 75 mm. The results shall be expressed to the nearest 0.1%.

Figure 1 Correction factor



## 8 Test report

The test report shall include:

- a) identification of the test specimen;
- b) type of specimen, core or cast cube or cylinder;
- c) condition of specimen when received (include poor compaction and honeycombing);
- d) details of reinforcement (if any);
- e) orientation of the specimen to the structure;
- f) date of receipt of the specimen;
- g) dimensions of the specimen;
- h) conditions of storage and curing until test date;
- i) date of beginning of tests (placing in oven);
- j) density of the specimen (as-received or saturated and method of determining volume);
- k) mass of each oven-dried specimen;
- l) mass of each specimen after the specified immersion period(s);
- m) measured absorptions;
- n) corrected absorptions and mean value;
- o) any specified deviations from the standard procedure;
- p) declaration by the person technically responsible for the test that it was carried out in accordance with this standard, except as noted in item o).

*NOTE* The test report can also include:

- a) *building project;*
- b) *part or component of the building;*
- c) *details of the concrete. other information, e.g. absorption time graph, comparison with a control specimen, etc.*

## Bibliography

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 12350, *Testing fresh concrete*

BS EN 12390, *Testing hardened concrete*

BS EN 12504, *Testing concrete in structures*

BS ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic methods for the determination of repeatability and reproducibility of a standard measurement method*

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