

# **Methods of test for masonry units —**

**Part 11: Determination of water  
absorption of aggregate concrete,  
manufactured stone and natural stone  
masonry units due to capillary action  
and the initial rate of water absorption  
of clay masonry units**

The European Standard EN 772-11:2000 has the status of a  
British Standard

ICS 91.100.15; 91.100.30

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## National foreword

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The UK participation in its preparation was entrusted by Technical Committee B/519, Masonry and associated tests, to Subcommittee B/519/1, Masonry units, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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### Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 7 and a back cover.

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This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 September 2000

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ISBN 0 580 36372 4

### Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 772-11**

March 2000

ICS 91.100.15; 91.100.30

English version

**Methods of test for masonry units - Part 11: Determination of water absorption of aggregate concrete, manufactured stone and natural stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units**

Méthodes d'essai des éléments de maçonnerie - Partie 11: Détermination de l'absorption de l'eau par capillarité des éléments de maçonnerie en béton de granulats, en pierre reconstituée et naturelle et du taux initial d'absorption d'eau des éléments de maçonnerie en terre cuite

Prüfverfahren für Mauersteine - Teil 11: Bestimmung der kapillaren Wasseraufnahme von Mauersteinen aus Beton, Betonwerksteinen und Natursteinen sowie der anfänglichen Wasseraufnahme von Mauerziegeln

This European Standard was approved by CEN on 26 February 2000.

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Ref. No. EN 772-11:2000 E

## Contents

	Page
Foreword.....	3
1 Scope.....	4
2 Normative references .....	4
3 Principle .....	4
4 Symbols.....	4
5 Apparatus .....	5
6 Preparation of specimens .....	5
7 Test procedure.....	6
8 Calculation and expression of results .....	6
9 Evaluation of results .....	7
10 Test report.....	7

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 125, Masonry, 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 September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard specifies a method of determining the water absorption coefficient due to capillary action for aggregate concrete, natural stone and manufactured stone masonry units and the initial rate of water absorption for clay masonry units.

## 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 revision 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.

- prEN 771-1 Specification for masonry units - Part 1: Clay masonry units.
- prEN 771-3 Specification for masonry units - Part 3: Aggregate concrete masonry units (dense and lightweight aggregates).
- prEN 771-5 Specification for masonry units - Part 5: Manufactured stone masonry units.
- prEN 771-6 Specification for masonry units - Part 6: Natural stone masonry units.
- prEN 772-16 Methods of test for masonry units - Part 16: Determination of dimensions.

## 3 Principle

After drying to constant mass, a face of the masonry unit is immersed in water for a specific period of time and the increase in mass is determined.

In the case of clay masonry units the initial rate of absorption of the bed face is measured. In the case of aggregate concrete, natural stone and manufactured stone masonry units the water absorption of face of the unit to be exposed is measured, as described in the relevant product standard.

## 4 Symbols

- $m_{dry,s}$  is the mass of the specimen after drying, (g)
- $m_{so,s}$  is the mass of the specimen in grams after soaking for time  $t$ , (g)
- $A_s$  is the gross area of the face of the specimen immersed in water, (mm<sup>2</sup>)
- $t_{so}$  is the time of soaking, (s)

Note: Specified in the relevant part of prEN 771.

$c_{w,s}$  is the coefficient of water absorption due to capillary action for, aggregate concrete, natural stone and manufactured stone masonry units, [ $\text{g}/(\text{m}^2 \times \text{s}^{0,5})$ ]

$c_{wi,s}$  is the initial rate of water absorption for clay masonry units, [ $\text{kg}/(\text{m}^2 \times \text{min})$ ]

## 5 Apparatus

**5.1 Large tray** of minimum depth of 20 mm and of plan area larger than the face of the masonry unit to be immersed, fitted with a means of maintaining constant water level.

**5.2 Supporting device** of 400 mm<sup>2</sup> maximum plan area to keep each specimen clear of the base of the tray.

**5.3 Stopwatch** graduated in seconds.

**5.4 Ventilated oven** capable of maintaining a temperature of 70 °C ± 5 °C for aggregate concrete, natural stone and manufactured stone units or 105 °C ± 5 °C for clay and autoclaved aerated concrete units.

**5.5 Weighing instrument** capable of weighing the specimens to an accuracy of 0,1 % of their mass when dry.

## 6 Preparation of specimens

### 6.1 Sampling

The method of sampling shall be in accordance with the relevant part of prEN 771. The minimum number of specimens shall be six, but a larger minimum number may be specified in the product specification, in which case that larger number shall be used.

### 6.2 Drying

Dry the test specimens to constant mass  $m_{dry,s}$  in a ventilated oven (5.4) at a temperature of 70 °C ± 5 °C for aggregate concrete, natural stone and manufactured stone masonry units or 105 °C ± 5 °C for clay masonry units. Constant mass is reached, if during the drying process in two subsequent weighings with a 24 h interval, the loss in mass between the two determinations is not more than 0,1 % of the total mass.

## 7 Test procedure

Allow the specimens to cool at room temperature. When cool, measure the dimensions of the faces to be immersed in accordance with the principle incorporated in prEN 772-16 and calculate the gross area  $A_s$ . Place the specimens with their faces (bed faces in the case of clay units) supported on a supporting device (5.2) so that they are clear of the base of the tray (5.1) and immerse in water to a depth of  $5 \text{ mm} \pm 1 \text{ mm}$  for the duration of the test. In the case of masonry units with an extremely irregular face, raise the water-level in such a way that the complete surface just makes contact with the water surface.

Activate the timing device. Maintain the water level constant throughout the test. For aggregate concrete, natural stone and manufactured stone units, cover the tank to avoid evaporation from the wet specimens.

After the immersion time ( $t_{so}$ ) specified in prEN 771-1, prEN 771-3, prEN 771-5 or prEN 771-6 remove the specimens, wipe off surface water and weigh them ( $m_{so,s}$ ).

For natural stone masonry units, remove the specimens from the water at regular intervals, wipe off the water, weigh them, then re-immerses them. Continue this procedure until no further increase in mass is observed.

## 8 Calculation and expression of results

### 8.1 Coefficient of water absorption due to capillary action of aggregate concrete, natural stone and manufactured stones units

Calculate the coefficient of water absorption of the masonry units due to capillary action of each specimen to the nearest  $1 \text{ g}/(\text{m}^2 \times \text{s}^{0,5})$  using the following formula:

$$c_{w,s} = \frac{m_{so,s} - m_{dry,s}}{A_s \sqrt{t_{so}}} \times 10^6 \left[ \text{g}/(\text{m}^2 \times \text{s}^{0,5}) \right]$$

In the case of natural stone masonry units, plot a graph of  $\frac{m_{so,s} - m_{dry,s}}{A_s}$  against the square root of the time immersed, in seconds. Calculate  $c_{w,s}$  as the gradient over the initial linear portion of the graph.

### 8.2 Initial rate of water absorption of clay masonry units

Calculate the initial rate of water absorption of each clay masonry unit to the nearest  $0,1 \text{ kg}/(\text{m}^2 \times \text{min})$  using the following formula:

$$c_{wi,s} = \frac{m_{so,s} - m_{dry,s}}{A_s t} \times 10^3 \left[ \text{kg}/(\text{m}^2 \times \text{min}) \right]$$

where  $t = 1 \text{ min}$ .



## 9 Evaluation of results

For aggregate concrete, natural stone and manufactured stone masonry units calculate the mean of the coefficients of water absorption due to capillary action to the nearest  $1 \text{ g}/(\text{m}^2 \times \text{s}^{0,5})$ .

For clay masonry units calculate the mean of the initial rates of water absorption to the nearest  $0,1 \text{ kg}/(\text{m}^2 \times \text{min})$ .

## 10 Test report

The test report shall contain the following information:

- a) the number, title and date of issue of this European Standard;
- b) the name of the organization that carried out the sampling and the method used;
- c) date of testing (in the case of aggregate concrete and manufactured stone masonry units only);
- d) the description of the specimens to the relevant part of prEN 771;
- e) the number of specimens in the sample and whether these are whole units or representative

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