
ICS 91.100.10

English version

Methods of test for mortar for masonry - Part 18: Determination of water absorption coefficient due to capillary action of hardened mortar

Méthodes d'essai des mortiers pour maçonneries - Partie 18: Détermination du coefficient d'absorption d'eau par capillarité des mortiers

Prüfverfahren für Mörtel für Mauerwerk - Teil 18: Bestimmung der kapillaren Wasseraufnahme von erhärtetem Mörtel (Festmörtel)

This European Standard was approved by CEN on 6 July 2002.

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Foreword

This document (EN 1015-18:2002) 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of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by September 2004.

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 method for determining the water absorption coefficient due to capillary action of hardened mortars containing mineral binders and normal as well as light weight aggregates.

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).

prEN 998-1, *Specification for mortar for masonry — Part 1: Rendering and plastering mortar.*

prEN 998-2, *Specification for mortar for masonry — Part 2: Masonry mortar.*

EN 1015-2:1998, *Methods of test for mortar for masonry — Part 2: Bulk sampling of mortars and preparation of test mortars.*

EN 1015-3, *Methods of test for mortar for masonry — Part 3: Determination of consistence of fresh mortar (by flow table).*

EN 1015-11, *Methods of test for mortar for masonry — Part 11: Determination of flexural and compressive strength of hardened mortar.*

3 Principle

The water absorption coefficient due to capillary action is measured using mortar prism specimens under prescribed conditions at atmospheric pressure. After drying to constant mass, one face of the specimen is immersed in 5 to 10 mm of water for a specific period of time and the increase in mass determined.

4 Symbols

M0	is (for renovation mortars) the dry mass of the specimen, (g)
M1	is the mass of the specimen after soaking for 10 min, (g)
M2	is the mass of the specimen after soaking for 90 min, (g)
M3	is (for renovation mortars) the mass of the specimen after soaking for 24 h, (g)
C	is the coefficient of water absorption for an individual mortar specimen, ($\text{kg}/(\text{m}^2\text{min}^{0.5})$) (for mortars other than renovation mortars) or (kg/m^2) (for renovation mortars)
C_m	is the mean coefficient of water absorption of the sample of mortar due to capillary action, ($\text{kg}/(\text{m}^2\text{min}^{0.5})$) (for mortars other than renovation mortars) or (kg/m^2) (for renovation mortars)

5 Apparatus

- 5.1 Tray**, of minimum depth of 20 mm and of plan area large enough to contain the specimens to be immersed and fitted with a means of maintaining a constant water level.
- 5.2 Four support pads or similar per specimen**, to store the specimen, with a minimum contact area, clear of the base tray and with the specified depth of immersion.
- 5.3 Stopwatch**, graduated in seconds.
- 5.4 Weighing instrument**, with an accuracy of 0,1 % of the total, dry mass of the test specimen.
- 5.5 Ventilated oven**, capable of maintaining a temperature of $60\text{ °C} \pm 5\text{ °C}$.
- 5.6 Trowel or palette knife**
- 5.7 Absorbent filter papers** with a specific mass of $200\text{ g/m}^2 \pm 20\text{ g/m}^2$ and water absorption capacity of $160\text{ g/m}^2 \pm 20\text{ g/m}^2$; twelve sheets each with a size of approximately $150\text{ mm} \times 175\text{ mm}$.
- 5.8 Conditioning chamber or room**, capable of maintaining a relative humidity of $95\% \pm 5\%$ and $65\% \pm 5\%$.
- 5.9 Metal mould and other ancillary apparatus** (to produce $160\text{ mm} \times 40\text{ mm} \times 40\text{ mm}$ prism specimens) as described in EN 1015-11.

6 Materials

- 6.1 Demineralized or distilled water**
- 6.2 Sealing material**, e.g. paraffin wax or synthetic reactive resin with a melting point above 60 °C .

7 Sampling and preparation and storage of test specimens

7.1 General

The fresh mortar for this test shall have a minimum volume of 1,5 l or at least 1,5 times the quantity needed to perform the test, whichever is the greater, and shall either be obtained by reduction of the bulk test sample (see EN 1015-2) using a sample divider or by quartering or by preparation from water and the other constituents in the laboratory. Three test specimens shall be prepared from the sample of mortar.

7.2 Laboratory prepared mortars

The length of mixing period shall be measured from the moment all the constituents are introduced into the mixer.

The mortar shall be brought to a defined flow value as specified in EN 1015-2 determined in accordance with EN 1015-3 and reported.

7.3 Mortars, other than laboratory prepared mortars

Ready to use mortars (factory-made wet mortars which are retarded), and pre-batched air-lime/sand wet mortars when not gauged with hydraulic binders, shall be used for specimen preparation within their specified workable life.

Before testing, the batch shall be gently stirred by hand using a trowel or palette knife (5.6) for 5 s to 10 s to counteract any false setting etc., but without any additional mixing of the batch.

The flow value of the mortar in the bulk test sample shall be determined in accordance with EN 1015-3 and reported.

7.4 Preparation and curing of test specimens

Prepare three test specimen prisms with dimensions 160 mm × 40 mm × 40 mm according to EN 1015-11. Line the base of the metal mould with filter paper and fill with mortar and strike off the surface flush with the top of the mould. Place a layer of filter paper on the mortar surface. Cure the test specimens under the conditions described in Table 1. At the end of the curing period, demould the specimens. Seal the four long faces of the specimens using the specified sealing material, then break them into two halves.

Table 1 — Curing of test specimens

Type of mortar	Curing time at a temperature of 20 °C ± 2 °C in days		
	95 % ± 5 % RH (relative humidity)		65 % ± 5 % RH
	in the mould ^{a)}	with the mould removed	with the mould removed
Lime mortars	5	2	21
Lime/cement mortars in which the amount of lime is greater than 50 % of the total binder weight	5	2	21
Cement and other lime/cement mortar	2	5	21
Mortars with other hydraulic binders	2	5	21
Retarded mortars	5	2	21

^{a)} In some cases an extended period of storage in the mould may be necessary.

7.5 Drying

Dry the test specimens to constant mass in a ventilated oven at a temperature of 60 °C ± 5 °C. 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 0,2 % of the total mass.

For renovation mortars only, record the dry mass of each specimen (M3).

8 Procedure

Place the specimens in the tray (5.1), with the broken faces of the prisms downwards, supported clear of the base of the tray on the four support pads (5.2), immersed in water (6.1) to a depth of 5 mm to 10 mm for the duration of the test (see Figure 1). To ensure full immersion of rough surface textured specimens avoiding trapping air bubbles beneath them, immerse them in a sloping attitude.

Activate the timing device. Maintain the water level constant throughout the test.

Cover the tray to avoid evaporation from the wet test specimens.

If visible wetting occurs on the free surface of the test specimens, stop the test. Break the specimens to ensure that they are fully saturated. If they are saturated then weigh the two pieces together. If not fully saturated, repeat the test with a new specimen.

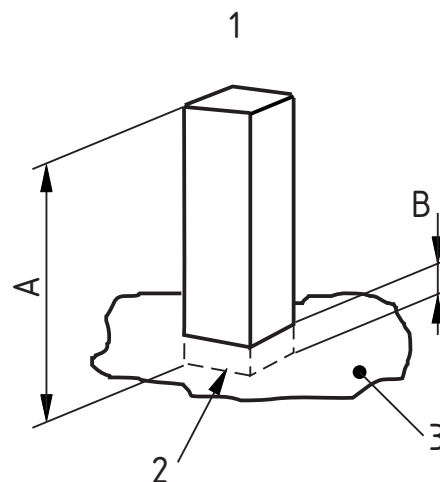
NOTE If, when the specimen is broken, it is not saturated across the whole area, it can be that the sealing of the long faces was inadequate. Therefore, special attention should be paid to this aspect of preparation of any replacement specimens.

For mortars other than renovation mortars:

remove the specimens from the tray after 10 min, wipe off rapidly surface water with a dampened cloth, weigh the specimen (M1) and replace them immediately into the tray. Repeat the same procedure after 90 min and weigh (M2).

For renovation mortars only:

remove the specimens from the tray after 24 h and weigh them (M3). Immediately afterwards, split each specimen along its length to give approximately pieces of dimension 80 mm × 40 mm × 20 mm. Measure the height of water penetration in the center of the specimen parallel to the 80 mm dimension with an accuracy of 1 mm.



Key

- 1 Prism specimen
 - 2 Broken end face of prism
 - 3 Water surface
 - A 80 mm approximately
 - B Immersion 5 to 10 mm*
- *10 mm if surface is heavily textured

Figure 1 — Render specimens

9 Calculation and expression of results

For other than renovation mortars the coefficient of water absorption is by definition equal to the slope of the straight line linking the representative points of the measurements carried out at 10 min and 90 min.

Calculate it on the basis of the following formula:

$$C = 0,1(M2 - M1) \text{ kg}/(\text{m}^2 \cdot \text{min}^{0,5})$$

For renovation mortar only, water absorption is measured in kg/m^2 after 24 h using the following formula:

$$C = 0,625(M3 - M0) \text{ kg}/\text{m}^2$$

and water penetration depth is determined in mm.

Calculate individual values of coefficient of water absorption (C) to the nearest $0,05 \text{ kg}/(\text{m}^2 \cdot \text{min}^{0,5})$ or nearest $0,05 \text{ kg}/\text{m}^2$ as relevant.

Calculate the mean value of coefficient of water absorption (C_m) from the individual values to the nearest $0,1 \text{ kg}/(\text{m}^2 \cdot \text{min}^{0,5})$ or nearest $0,05 \text{ kg}/\text{m}^2$ as relevant.

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 place, date and time of taking the bulk test sample¹⁾²⁾;
- c) the method used for taking the bulk test sample (if known) and the name of the organization that took it;
- d) the type, origin and designation of the mortar by reference to part 1 or 2 of prEN 998;
- e) preparation (mixing, casting) and curing conditions;
- f) the date and time of preparation of the specimens for test;
- g) the flow value of the test mortar determined in accordance with EN 1015-3;
- h) the date and time of testing;
- i) individual values of coefficient of water absorption due to capillary action (C) stated to the nearest $0,05 \text{ kg}/(\text{m}^2 \cdot \text{min}^{0,5})$ or nearest $0,05 \text{ kg}/\text{m}^2$ as relevant, and, for other than renovation mortars, the length of time of immersion of each specimen;
- j) the mean coefficient of water absorption due to capillary action (C_m) stated to the nearest $0,1 \text{ kg}/(\text{m}^2 \cdot \text{min}^{0,5})$ or nearest $0,05 \text{ kg}/\text{m}^2$ as relevant;
- k) remarks, if any.

1) The sample taken from the bulk supply that is to be used for all of the tests in EN 1015.

2) This information is contained on the certificate of sampling (see 5.4 of EN 1015-2:1998).