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**Metode preskušanja zidakov - 3. del: Ugotavljanje neto prostornine in odstotnega deleža lukenj v opečnih zidkih s tehtanjem v vodi**

Methods of test for masonry units - Part 3: Determination of net volume and percentage of voids of clay masonry units by hydrostatic weighing

Prüfverfahren für Mauersteine - Teil 3: Bestimmung des Nettovolumens und des prozentualen Lochanteils von Mauerziegeln mittels hydrostatischer Wägung (Unterwasserwägung)

Méthodes d'essai des éléments de maçonnerie - Partie 3: Détermination du volume net et du pourcentage des vides des éléments de maçonnerie en terre cuite par pesée hydrostatique

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English version

## Methods of test for masonry units - Part 3: Determination of net volume and percentage of voids of clay masonry units by hydrostatic weighing

Méthodes d'essai des éléments de maçonnerie - Partie 3:  
Détermination du volume net et du pourcentage des vides  
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Prüfverfahren für Mauersteine - Teil 3: Bestimmung des  
Nettovolumens und des prozentualen Lochanteils von  
Mauerziegeln mittels hydrostatischer Wägung  
(Unterwasserwägung)

This European Standard was approved by CEN on 2 July 1998.

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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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
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## 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of an identical text or by endorsement, at the latest by February 1999, and conflicting national standards shall be withdrawn at the latest by September 2000.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 net volume of and percentage of voids in clay masonry units (including frogs and cells).

## 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.

- pr EN 771-1 Specification for masonry units - Part 1: Clay masonry units  
pr EN 772-16 Methods of test for masonry units - Part 16: Determination of dimensions

## 3 Principle

The principle of this test is to obtain the net volume of the masonry unit by weighing in air and weighing in water and to subtract this from the gross volume, obtained by measurement of its dimensions, to obtain the volume of voids.

## 4 Symbols

$M_{wu}$  is the apparent mass of the specimen in water, (g)

$M_{au}$  is the mass of the specimen in air, (g)

$l_u$  is the length of the specimen, (mm)

$w_u$  is the width of the specimen, (mm)

$h_u$  is the height of the specimen, (mm)

$V_{gu}$  is the gross volume of the specimen, (mm<sup>3</sup>)

$V_{vu}$  is the volume of voids in the specimen, (mm<sup>3</sup>)

$V_{nu}$  is the net volume of the specimen, (mm<sup>3</sup>)

$\rho_w$  is the density of water, (g/mm<sup>3</sup>)(approx. 0,001 g/mm<sup>3</sup>)

## 5 Apparatus

5.1 A **tank** with adequate capacity to submerge a whole masonry unit.

5.2 A **weighing instrument** capable of weighing whole masonry units with an accuracy of at least 0,1 % of their mass when dry.

## 6 Sampling

The method of sampling shall be in accordance with **prEN 771-1**. 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.

## 7 Test procedure

Measure the length ( $l_u$ ), width ( $w_u$ ) and height ( $h_u$ ) of the specimen in accordance with **prEN 772-16**.

Immerse the specimen in water (5.1) for at least 1 hour. When the apparent masses ( $M_{wu}$ ), measured by two successive weighings at 30 min intervals, differ by less than 0,2% remove the specimen from the water and record the result of the second weighing as the apparent mass ( $M_{wu}$ ). Remove surface water with a damp towel and determine the weight ( $M_{au}$ ) immediately.

## 8 Calculation and expression of results

Calculate the net volume of the specimen ( $V_{nu}$ ) by subtracting the mass of the specimen obtained by weighing it under water from that obtained when weighing it in air ( $M_{au} - M_{wu}$ ) dividing it by the density of water ( $\rho_w$ ). Express the net volume of the specimen to the nearest 10<sup>4</sup> mm<sup>3</sup> as

$$V_{nu} = \frac{M_{au} - M_{wu}}{\rho_w} \quad (1)$$

Determine the mean value of net volume determinations to the nearest 10<sup>4</sup> mm<sup>3</sup>.

Calculate the gross volume of the specimen ( $V_{gu}$ ) by multiplying the length ( $l_u$ ) by the height ( $h_u$ ) and width ( $w_u$ ) of the specimen measured in accordance with **pr EN 772-16** to the nearest 10<sup>4</sup> mm<sup>3</sup>.

$$V_{gu} = l_u \times w_u \times h_u \quad (2)$$

Calculate the volume of voids ( $V_{vu}$ ) by

$$V_{vu} = V_{gu} - V_{nu} \quad (3)$$

Calculate the percentage of voids to the nearest 1% by

$$\frac{V_{vu}}{V_{gu}} \times 100\% \quad (4)$$

Determine the mean value, if required to the nearest 1%.

## 9 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) the date of testing,
- d) the type, origin and designation of the masonry unit by reference to pr EN 771-1,
- e) the number of specimens in sample,
- f) the net volume of each specimen and the mean value to the nearest  $10^4 \text{ mm}^3$ ,
- g) the percentage of voids of each specimen and the mean value, if required, to the nearest 1%,
- h) remarks, if any.