# SLOVENSKI STANDARD

**SIST EN 771-1:2004**

**01-januar-2004**

---

**Specifikacija za zidake ï 1. del: Opeļ ni zidaki**

Specification for masonry units - Part 1: Clay masonry units

Festlegungen für Mauersteine - Teil 1: Mauerziegel

Spécifications pour éléments de maçonnerie - Partie 1: Briques de terre cuite



**Ta slovenski standard je istoveten z: EN 771-1:2003**

---



**ICS:**

91.100.25

**SIST EN 771-1:2004** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 771-1

April 2003

ICS 91.100.25

English version

# Specification for masonry units - Part 1: Clay masonry units

Spécifications pour éléments de maçonnerie - Partie 1: Briques de terre cuite

Festlegungen für Mauersteine - Teil 1: Mauerziegel

This European Standard was approved by CEN on 2 October 2002.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: rue de Stassart, 36 B-1050 Brussels**



Ref. No. EN 771-1:2003 E

# Contents

Page

# Foreword

This document (EN 771-1:2003) has been prepared by Technical Committee CEN/TC 125 "*Masonry*", the secretariat of which is held by BSI, following initial preparation by Working Group 1.

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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by January 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports the essential requirements of the EU Construction Products Directive (89/106/EEC)

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

It also takes into account the general rules for unreinforced and reinforced masonry in Eurocode 6.

Annexes A and C of this document are normative, annexes B and ZA are informative.

EN 771 *Specification for masonry units* consists of:



— Part 1: Clay masonry units

— Part 2: Calcium silicate masonry units



— Part 3: Aggregates concrete masonry units (dense and light-weight aggregates)

— Part 4: Autoclaved aerated concrete masonry units

— Part 5: Manufactured stone masonry units

— Part 6: Natural stone masonry units

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

# 1 Scope

This European Standard specifies the characteristics and performance requirements for masonry units manufactured from clay for use in masonry construction (e.g. facing and rendered masonry, loadbearing or non-loadbearing masonry structures, including internal linings and partitions, for building and civil engineering).

This European Standard is intended to apply to two groups of fired-clay masonry units:

LD units (see 3.4 and 5.2) comprising:

clay masonry units with a gross dry density of less than or equal to 1000 kg/m$^3$ for use in protected masonry.

HD units (see 3.5 and 5.3) comprising:

a) all clay masonry units for use in unprotected masonry;

b) clay masonry units with a gross dry density of greater than 1000 kg/m$^3$ for use in protected masonry.

This European Standard includes those clay masonry units of an overall non-rectangular parallelepiped shape.



It defines the performance related to e.g. dimensional tolerances, strength, density measured according to the corresponding test methods contained in separate European Standards.



It provides for the evaluation of conformity of the product to this European Standard.



The marking requirement for products covered by this European Standard is included.

This European Standard does not specify standard sizes for clay masonry units, nor standard work dimensions and angles of specially shaped clay masonry units.

This European Standard does not cover requirements for the following: units for paving, flue liners and storey height clay units and clay masonry units with an incorporated thermal insulation material bonded to the faces of the unit susceptible to be exposed to fire. It does, however, include clay units for external chimney masonry.

# 2 Normative references

This European Standard incorporates by dated and 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 772-1:2000, *Methods of test for masonry units — Part 1: Determination of compressive strength*

EN 772-3, *Methods of test for masonry units — Part 3: Determination of net volume and percentage of voids of clay masonry units by hydrostatic weighing*

EN 772-5, *Methods of test for masonry units — Part 5: Determination of the active soluble salts content of clay masonry units*

EN 772-7, *Methods of test for masonry units — Part 7: Determination of water absorption of clay masonry damp proof course units by boiling in water*

EN 772-11, *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*

EN 772-13, *Methods of test for masonry units — Part 13: Determination of net and gross dry density of masonry units (except for natural stone)*

EN 772-16: 2000, *Methods of test for masonry units — Part 16: Determination of dimensions*

EN 772-19, *Methods of test for masonry units — Part 19: Determination of moisture expansion of large horizontally perforated clay masonry units*

EN 1052-3, *Methods of test for masonry — Part 3: Determination of initial shear strength*

EN 1745, *Masonry and masonry products — Methods for determining design thermal values*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*



## 3 Terms and definitions

For the purpose of this European standard, the following terms and definitions apply.



NOTE Annex B to this European standard is informative and gives descriptions of such matters as applications, exposure, and durability.

**3.1**
**masonry unit**
preformed component intended for use in masonry construction

**3.2**
**clay masonry unit**
masonry unit made from clay or other argillaceous materials with or without sand, fuel or other additives fired at a sufficiently high temperature to achieve a ceramic bond

**3.3**
**protected masonry**
masonry which is protected against water penetration. It can either be masonry in external walls which is protected, (e.g. by a layer of suitable render or by cladding), or it can be the inner leaf of a cavity wall or it can be an internal wall. It may or may not be loadbearing

**3.4**
**LD unit**
clay masonry unit with a low gross dry density for use in protected masonry

**3.5**
**HD unit**
clay masonry unit for unprotected masonry as well as clay masonry unit with a high gross dry density for use in protected masonry

**3.6**
**co-ordinating size**
size of the co-ordinating space allocated to a masonry unit including allowances for joints and tolerances

**3.7**
**work size**
size of a masonry unit specified for its manufacture, to which the actual size conforms within permissible deviations

**3.8**
**actual size**
size of a masonry unit as measured

**3.9**
**regular shaped masonry unit**
masonry unit with an overall rectangular parallelepiped shape

**3.10**
**specially shaped masonry unit**
masonry unit which is not a rectangular parallelepiped

**3.11**
**accessory unit**
masonry unit which is shaped to provide a particular function, e.g. to complete the geometry of the masonry



**3.12**
**interlocking features**
shaped matched projections and indentations on masonry units, e.g. tongue and groove systems



**3.13**
**vertical perforation**
formed void that passes completely through a masonry unit perpendicular to the bed face

**3.14**
**horizontal perforation**
formed void that passes completely through a masonry unit parallel to the bed face

**3.15**
**cell**
formed void that does not pass through a masonry unit

**3.16**
**frog**
depression formed in one or both bed faces of a unit, the total volume of all such depressions which does not exceed a certain limit of the overall volume of the unit, i.e. length $\times$ width $\times$ height

**3.17**
**recess**
depression or indentation in one or more surfaces of a masonry unit (e.g. mortar pocket, rendering keyway, griphole)

**3.18**
**grip hole**
a formed void that passes completely through a masonry unit perpendicular to the bed face for the purpose of handling the masonry unit

**3.19**
**shell**
peripheral material between a perforation and the surface of a masonry unit

**3.20**
**web**
solid material between the perforations in a masonry unit

**3.21**
**declared value**
value that a manufacturer is confident in achieving, bearing in mind the precision of test and the variability of the manufacturing process



**3.22**
**mean compressive strength of masonry units**
arithmetic mean of the compressive strengths of masonry units



**3.23**
**normalised compressive strength**
compressive strength of masonry units converted to the air dry compressive strength of an equivalent 100 mm wide $\times$ 100 mm high masonry unit

NOTE See the procedure given in Annex A of EN 772-1: 2000

**3.24**
**damp proof course unit**
clay masonry unit which when laid in two courses with broken bond in a strong cementitious mortar, will resist rising damp in masonry

**3.25**
**high precision clay masonry unit**
clay masonry unit with small dimensional tolerance especially in unit height

**3.26**
**vertically perforated or hollow clay masonry unit**
clay masonry unit with one or more formed voids that pass completely through a masonry unit perpendicular to the bed face

**3.27**
**horizontally perforated or hollow clay masonry unit**
clay masonry unit with one or more formed voids that pass completely through a masonry unit parallel to the bed face

**3.28**
**clay masonry unit for concrete or mortar infill**
clay masonry unit with special perforation suitable for concrete or mortar infill

**3.29**
**clay masonry unit for masonry panels**
clay masonry unit suitable for production of reinforced masonry or masonry storey height panels with vertical channels for mortar or concrete infill

**3.30**
**clay masonry subject to severe exposure**
masonry or elements of masonry which under end use conditions are subjected to saturation with water (driving rain, ground water) combined with frequent freeze/thaw-cycling, due to climatic conditions and absence of protective features

**3.31**
**clay masonry subject to moderate exposure**
masonry or elements of masonry which under end use conditions are exposed to moisture and freeze/thaw-cycling, excluding constructions subjected to severe exposure

**3.32**
**clay masonry subject to passive exposure**
masonry or elements of masonry which under end use conditions are not intended to be exposed to moisture and freezing conditions

**3.33**
**Category I masonry units**
units with a declared compressive strength with a probability of failure to reach it not exceeding 5 %. This may be determined via the mean or characteristic value



**3.34**
**Category II masonry units**
units not intended to comply with the level of confidence of Category I units



## 4 Materials and manufacture

See 3.2 and 8.3.2.

## 5 Requirements for clay masonry units

### 5.1 General

The requirements and properties specified in this standard shall be defined in terms of the test methods and other procedures referred to in this European Standard.

NOTE It should be noted that the test methods are not usually applicable to specially shaped and accessory units as defined in 3.10 and 3.11.

The conformity criteria given in the following subclauses relate to initial type testing (see 8.2) and, when relevant, to consignment testing (see annex A). For the compressive strength of Category I units use a 50 % fractile (p = 0,50) for mean values and a confidence level of 95 %.

For production evaluation the manufacturer shall define the conformity criteria in the factory production control documentation (see 8.3).

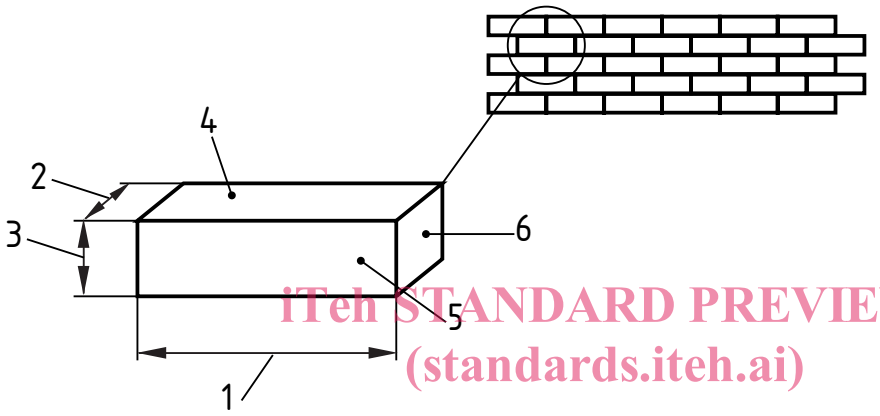
The manufacturer shall declare whether the unit fulfils the requirements for LD-units (see Figure 2) or HD-units (see Figure 3).

## 5.2 LD-units

### 5.2.1 Dimensions and tolerances (LD units)

**5.2.1.1 Dimensions (LD units)** The dimensions of a clay masonry unit shall be declared by the manufacturer in mm for length, width, and height, in that order (see Figure 1). They shall be given in terms of work size.

NOTE 1 In addition the co-ordinating size may be given.






**Key**

1 Length
2 Width
3 Height
4 Bed
5 Face
6 Header

NOTE This relates to the normal use of the masonry unit in the wall.

**Figure 1 — Dimensions and surfaces**

The manufacturer shall also declare which of the tolerance categories for mean values in 5.2.1.2 the clay masonry units fulfil.

When relevant to the uses for which the unit is put on the market, the manufacturer shall declare which of the range categories in 5.2.1.2 a given consignment of the clay masonry units fulfils.

NOTE 2 This additional declaration may be made for example in relation to:

— the achievement of the required accuracy (planarity, bonds and thin layer joints) of the masonry;

— the use of detailed project drawings to achieve these requirements.

#### 5.2.1.2 Tolerances (LD units)

Mean value

When clay masonry units are sampled from a consignment in accordance with annex A and tested in accordance with EN 772-16 using the measurement procedure stated below the difference for all dimensions between the declared value and the mean value derived from measurements of the test sample shall be not greater than the declared one of the following categories, where the value shall be rounded to whole mm:

T1: ± 0,40 $\sqrt{(\text{work size dimension})}$ mm or 3 mm whichever is the greater

T1+: ± 0,40 $\sqrt{(\text{work size dimension})}$ mm or 3 mm for length and width whichever is the greater and

± 0,05 $\sqrt{(\text{work size dimension})}$ mm or 1 mm for the height whichever is the greater

T2: ± 0,25 $\sqrt{(\text{work size dimension})}$ mm or 2 mm whichever is the greater

T2+: ± 0,25 $\sqrt{(\text{work size dimension})}$ mm or 2 mm for length and width whichever is the greater and

± 0,05 $\sqrt{(\text{work size dimension})}$ mm or 1 mm for the height whichever is the greater



or Tm: a deviation in mm declared by the manufacturer (may be wider or closer than the other categories).



Range

When declared and the clay masonry units are sampled from a consignment in accordance with annex A and tested in accordance with EN 772-16 using the measurement procedure stated below the maximum range for any given dimension (i.e. the difference between the largest and smallest determined dimensions on individual units) to be found within the test sample shall be within the declared one of the three categories indicated below, where the value shall be rounded to whole mm:

| Category | Maximum range |
|---|---|
| R1: | 0,6 $\sqrt{(\text{work size dimension})}$ mm |
| R1+: | 0,6 $\sqrt{(\text{work size dimension})}$ mm for length and width and<br>1,0 mm for the height |
| R2: | 0,3 $\sqrt{(\text{work size dimension})}$ mm |
| R2+: | 0,3 $\sqrt{(\text{work size dimension})}$ mm for length and width and<br>1,0 mm for the height |

or Rm: a range in mm declared by the manufacturer (may be wider or closer than the other categories)

Measurement procedure

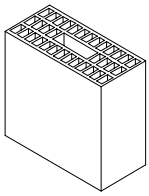
The following measurement procedure shall be used:

— when at least two of the work dimensions of the unit are not greater than 250 mm, 125 mm and 100 mm for length, width and height respectively procedure **b** as described in EN 772-16:2000 shall be followed using a calliper with overlapping jaws with the jaws aligning with the dotted lines in Fig. 1 b) of EN 772-16:2000 with the exception for the measurement of the height which is determined as the average of two measurements, where the second measurement is transverse to the dotted line at the middle of the unit. The width of the jaws shall be not less than 5 and not greater than 10 mm.

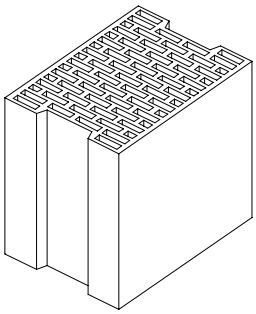
— for all other units procedure **a** as described in EN 772-16:2000 shall be followed.

### 5.2.2 Configuration (LD units)

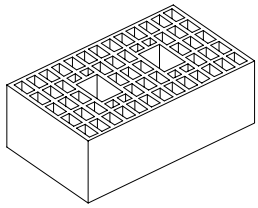
#### 5.2.2.1 General (LD units)



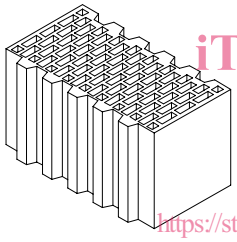
a.Vertically perforated unit

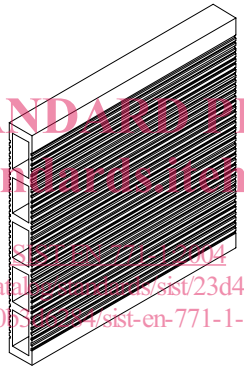


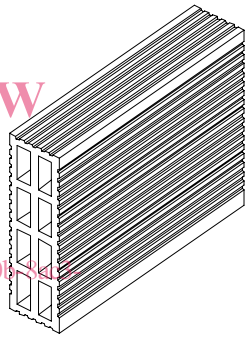
b.Vertically perforated unit with mortar pocket



c.Vertically perforated unit with grip holes





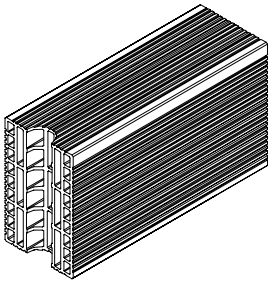


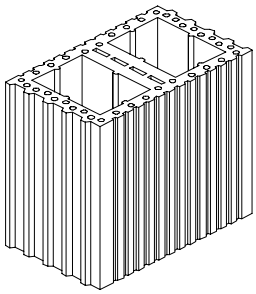


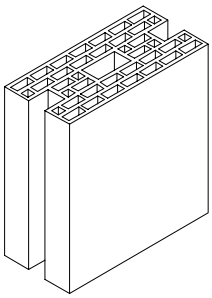
d. Vertically perforated unit with tongue and groove system

e. Horizontally perforated unit (for partition walls)

f. Horizontally perforated unit with rendering keyways







g.Horizontally perforated unit with mortar pocket

h. Unit for concrete or mortar infill

i. Unit for masonry panels

**Figure 2 — Examples of LD units**