



## BSI Standards Publication

### Methods of test for masonry units

---

Part 22: Determination of freeze/thaw resistance of clay masonry units

## National foreword

This British Standard is the UK implementation of EN 772-22:2018.

BSI, as a member of CEN, is obliged to publish EN 772-22:2018 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.

The UK committee submitted a negative vote due to the following concerns.

Within the UK:

- a) all Category F1 classification clay masonry units (see subclause 10.2) have been found to perform at similar durability levels regardless of the number of freeze/thaw cycles they achieve when tested against the requirements in service of EN 772-22:2018. Furthermore, there is no body of evidence for identifying the appropriate practical use of bricks assessed as not having failed after a specific number of freeze/thaw cycles within a test panel – therefore it is not considered appropriate for UK manufacturers to include the number of cycles achieved in a test for F1 clay masonry units. Consequently, in respect of the F1(n) classification, the (n) value is typically not quoted by UK manufacturers.
- b) the Category F2 classification (see subclause 10.2) is recommended for use in areas with a high risk of saturation with freezing (MX3.2 – see Table A.1 in BS EN 1996-2:2006 *Eurocode 6 – Design of masonry structures – Part 2: Design considerations, selection of materials and execution of masonry*) and all exposure conditions of lesser degree (see Table 15 in PD 6697:2010 *Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2*). The Category F2 (80°C) classification in the UK is intended for specialist areas. Therefore it is not expected that this classification will be widely used, compared to the current F2 category.
- c) there are industry concerns with the restrictions placed on the use of joints formed of neoprene rubber or similar for test panel construction (see subclause 8.1). A mortar joint adds a greater number of variables including products and workmanship to the test, which could impact the results. There is also industry concern that the use of mortar joints could make it more difficult for manufacturers to determine whether damage was attributed to the freeze/thaw cycles or to the dismantling of the test panel.

The UK participation in its preparation was entrusted to Technical Committee B/519, Masonry and associated testing.

A list of organizations represented on this committee can be obtained on request to its secretary.

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

© The British Standards Institution 2019  
Published by BSI Standards Limited 2019

ISBN 978 0 539 03706 7

ICS 91.100.25

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2018.

**Amendments/corrigenda issued since publication**

| Date            | Text affected                           |
|-----------------|-----------------------------------------|
| 31 January 2019 | Missing text added to National foreword |



English Version

## Methods of test for masonry units - Part 22: Determination of freeze/thaw resistance of clay masonry units

Méthodes d'essai des éléments de maçonnerie - Partie  
22: Détermination de la résistance au gel/dégel des  
éléments de maçonnerie en terre cuite

Prüfverfahren für Mauersteine - Teil 22: Bestimmung  
des Frost-Tau-Widerstandes von Mauerziegeln

This European Standard was approved by CEN on 26 October 2018.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

| <b>Contents</b>                                                                   | <b>Page</b> |
|-----------------------------------------------------------------------------------|-------------|
| <b>European Foreword</b> .....                                                    | <b>3</b>    |
| <b>1 Scope</b> .....                                                              | <b>4</b>    |
| <b>2 Normative references</b> .....                                               | <b>4</b>    |
| <b>3 Terms and definitions</b> .....                                              | <b>4</b>    |
| <b>4 Principle</b> .....                                                          | <b>4</b>    |
| <b>5 Apparatus</b> .....                                                          | <b>4</b>    |
| <b>6 Materials</b> .....                                                          | <b>5</b>    |
| <b>7 Preparation of specimens</b> .....                                           | <b>5</b>    |
| 7.1 Sampling.....                                                                 | 5           |
| 7.2 Water absorption .....                                                        | 5           |
| 7.3 Conditioning and preparation of specimens.....                                | 5           |
| <b>8 Construction of a test panel</b> .....                                       | <b>6</b>    |
| 8.1 General.....                                                                  | 6           |
| 8.2 Conditioning of a test panel.....                                             | 8           |
| 8.2.1 General.....                                                                | 8           |
| 8.2.2 Partial saturation by cold water immersion .....                            | 8           |
| 8.2.3 Partial saturation by immersion in water at 80°C .....                      | 8           |
| <b>9 Procedure of freezing and thawing</b> .....                                  | <b>8</b>    |
| 9.1 General.....                                                                  | 8           |
| 9.2 Freeze/thaw cycling.....                                                      | 8           |
| 9.2.1 General.....                                                                | 8           |
| 9.2.2 Freezing period.....                                                        | 9           |
| 9.2.3 Thawing period.....                                                         | 9           |
| 9.2.4 Reconditioning after an interruption .....                                  | 9           |
| 9.3 Examination of test panel and units.....                                      | 9           |
| <b>10 Evaluation of results</b> .....                                             | <b>9</b>    |
| 10.1 Assessment of damage .....                                                   | 9           |
| 10.2 Assessment of freeze/thaw resistance.....                                    | 10          |
| <b>11 Test report</b> .....                                                       | <b>12</b>   |
| <b>Annex A (informative) Heat flow meter</b> .....                                | <b>14</b>   |
| <b>Annex B (normative) Calibration — Measurement of rate of spray water</b> ..... | <b>16</b>   |
| <b>Annex C (normative) Calibration — Measurement of heat transfer rate</b> .....  | <b>17</b>   |

## European Foreword

This document (EN 772-22:2018) 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 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 772-22:2006.

The most significant changes compared to the previous edition include:

- definition for sand grading for mortar has been tightened;
- rubber joints between units are only permitted for product development and factory production control testing;
- a clause for partial saturation at 80 °C is added;
- only flush finish joints are permitted;
- monitoring of temperature is taken from 30 mm from the face not 40 mm;
- classification as F2 is given if not more than 10% of units exhibit damage of Type 4 or above, rather than no units of type 4 or above;
- classifications of F1(n) and F2(80°C) are added;
- a detailed description of a heat flow meter is provided.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## 1 Scope

This document specifies a method for determining the freeze/thaw resistance of clay masonry units in one of two categories F1 or F2.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 771-1, *Specification for masonry units — Part 1: Clay masonry units*

EN 772-21, *Methods of test for masonry units — Part 21: Determination of water absorption of clay and calcium silicate masonry units by cold water absorption*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 13139, *Aggregates for mortar*

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

## 4 Principle

A panel of clay masonry units is assembled from units and rapid hardening mortar which when sufficiently hardened is immersed in water for a prescribed period of time. The panel is subsequently cooled for a specified period and the water in the units near to one face is repeatedly thawed and refrozen while the rear of the panel remains permanently frozen (achieving a so called pinch effect). Damage caused by the freezing and thawing action is assessed and used to determine the freeze/thaw resistance of the bricks.

## 5 Apparatus

An appropriate **testing machine** capable of generating the freeze–thaw cycles specified in 9.2 and ensuring unidirectional freezing and thawing through one face of the units.

Several different designs of testing machines are suitable all of which use a fan to circulate air in the machine. It is important that the machine circulates the air such that the flow is essentially parallel to the face of the panel under test.

A **water tank for soaking**, made of plastic or steel.

A **heat flow meter**. The heat flow meter is an insulated device for extracting heat over the central area of the surface of what during a test would be the exposed face of the panel. The area is matt black and shall be capable of extracting heat such that when the air temperature is recorded as  $-15^{\circ}\text{C}$  as in 9.2.2 and the centre of the plate is maintained at  $0^{\circ}\text{C}$  the average rate of heat extraction can be measured. A typical example is described in Annex A and a suitable calibration procedure in Annex C.