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Methods of test for masonry units - Part 1: Determination of compressive strength

Prüfverfahren für Mauersteine - Teil 1: Bestimmung der Druckfestigkeit

Méthodes d'essai des éléments de maçonnerie - Partie 1: Détermination de la résistance à la compression

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Methods of test for masonry units - Part 1: Determination of compressive strength

Méthodes d'essai des éléments de maçonnerie - Partie 1:
Détermination de la résistance à la compression

Prüfverfahren für Mauersteine - Teil 1: Bestimmung der
Druckfestigkeit

This draft European Standard is submitted to CEN members for unique acceptance procedure. It has been drawn up by the Technical Committee CEN/TC 125.

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Foreword

This document (FprEN 772-1:2010) has been prepared by Technical Committee CEN/TC 125 "Masonry", the secretariat of which is held by BSI.

This document is currently submitted to the Unique Acceptance Procedure.

This document will supersede EN 772-1:2000.

There have been no technical changes compared to EN 772-1:2000. The opportunity has been taken to introduce a normative Annex B which includes the methods of surface preparation and conditioning for each unit type. This information was previously available in the product specifications only, consequently EN 772-1 now becomes a stand-alone document.

FprEN 772-1:2010 (E)

1 Scope

This European Standard specifies a method for determining the compressive strength of masonry units.

2 Normative references

The following referenced documents are indispensable for the application 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 771-2, *Specification for masonry units — Part 2: Calcium silicate masonry units*

EN 771-3, *Specification for masonry units — Part 3: Aggregate concrete masonry units (dense and lightweight aggregates)*

EN 771-4, *Specification for masonry units — Part 4: Autoclaved aerated concrete masonry units*

EN 771-5, *Specification for masonry units — Part 5: Manufactured stone masonry units*

EN 771-6, *Specification for masonry units — Part 6: Natural stone masonry units*

EN 772-2, *Methods of test for masonry units — Part 2: Determination of percentage area of voids in aggregate concrete masonry units (by paper indentation)*

EN 772-10, *Methods of test for masonry units — Part 10: Determination of moisture content of calcium silicate and autoclaved aerated concrete 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)*

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

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

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1:2005)*

3 Principle

The specimens, after preparation, when needed, are laid and centred on the platen of a compression testing machine. A uniformly distributed load is applied and increased continuously up to failure.

4 Symbols

f_b normalised compressive strength of masonry unit (N/mm^2);

d shape factor multiplier used to convert the air-dry compressive strength of the masonry specimens to the normalised compressive strength.

5 Materials

Sand with a maximum grain size of 1 mm.

Cement

6 Apparatus

6.1 Testing machine that conforms to the requirements of Table 1

Table 1 - Requirements for testing machines

| Maximum permissible repeatability of forces as percentage of indicated force | Maximum permissible mean error of forces as percentage of indicated force | Maximum permissible error of zero force as percentage of maximum force of range |
|--|---|---|
| % | % | % |
| 2,0 | ± 2,0 | ± 0,4 |

The testing machine shall have adequate capacity to crush all the test specimens, but the scale used shall be such that the failure load on the specimen exceeds one-fifth of the full scale reading. The machine shall be provided with a load-pacer or equivalent means to enable the load to be applied at the rate given in 8.2. The testing machine shall be equipped with two steel-bearing platens. The stiffness of the platens and the manner of load transfer shall be such that the deflection of the platen surfaces at failure load shall be less than 0,1 mm measured over 250 mm. The platens shall either be through hardened or the faces case hardened. The testing faces shall have a Vickers hardness of at least 600 HV when tested in accordance with EN ISO 6507-1.

One platen of the machine shall be able to align freely with the specimens as contact is made, but shall be restrained by friction or other means from tilting during loading. The other platen shall be a plane non-tilting block. The bearing faces of both platens shall be larger than the size of the largest specimen to be tested. Where auxiliary platens are used, they shall be properly located and of the same hardness, stiffness and planeness as the main platens. The bearing surfaces of the platens shall not depart from a plane by more than 0,05 mm.

6.2 Weighing instrument capable of weighing specimens to an accuracy of 0,1% of their mass.

6.3 Sufficient stiff steel strips for use on shell bedded or strip bedded ground units (See 8.1)

7 Preparation of specimens

7.1 Sampling

The method of sampling shall be in accordance with the relevant part of EN 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. In the case of large masonry units representative portions, e.g. cubes, may be cut from the masonry unit in different positions as stated in the relevant part of EN 771 (see also Note to 7.2.4).

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7.2 Surface preparation

7.2.1 General

Specimens shall be tested in the orientation specified, and this shall be stated in the test report. For certain forms of construction, it will be necessary to test the masonry units in more than one orientation. Where grinding in accordance with 7.2.4 significantly alters the contact surface or reduces the height significantly alternative approaches are required, see 7.2.4. Where it is not practicable to prepare clay HD units by grinding e.g. high strength units, the surface preparation may be carried out by capping in accordance with 7.2.5

After the removal of any superfluous material, e.g. flashing from the production process, the faces of the specimen, whether a whole masonry unit or a piece cut from a larger unit (see 7.1), through which the load is to be applied, shall be plane to a tolerance of 0,1 mm in any 100 mm and such that the top surface lies between two parallel planes which are parallel to the bottom surface, and not greater than 1 mm apart for every 100 mm. If the test faces of the masonry unit as manufactured, or the piece cut from a larger unit, fail to achieve this specification, then prepare the surfaces either by grinding (see 7.2.4) or by capping (see 7.2.5).

Masonry units containing frogs, and not required to be capped, shall additionally be treated as given in 7.2.3

If the specimens contain grooves or tongues first prepare them as given in 7.2.2. Test specimens shall be prepared in accordance with Annex B.

State the method of surface preparation in the test report.

7.2.2 Removal of tongues and grooves

Remove any tongues and/or grooves on the test faces of units prior to testing. If pieces are to be cut from larger units, arrange the cutting so that any tongues and/or grooves are eliminated.

7.2.3 Preparation of masonry units containing frogs and which are not to be capped

For masonry units with frogs that are assessed to have a net loaded area of more than 35 % of the bed face, test them without removing or filling the frogs. Where the net loaded area of masonry units with frogs is less than or equal to 35 % of the gross area then the frogs shall be filled with mortar of the same kind as used for capping (see 7.2.5) and the curing shall be carried out in accordance with the requirements of 7.2.5.4.

7.2.4 Grinding

Grind the surfaces of the specimen until the requirement for planeness and parallelism given in 7.2.1 is achieved. However, if the masonry units have frogs, indented lettering, cavities, perforations, internal or external holes, leave these in place. If the grinding process would significantly alter the contact area of the tested faces then the capping procedure of 7.2.5 shall be followed. If the remaining height of the specimens after they are ground is less than 40 mm or the height/width ratio less than 0,4, then make up a composite specimen by placing one upon the other without using any mortar or binding material or separating layer(s) between them.

NOTE Where a composite specimen is made up from more than one ground unit, this should be considered as a single specimen providing a single test result. Accordingly, a greater number of masonry units than that specifically stated in EN 771 will be necessary in order to provide the required number of test results.

7.2.5 Capping

7.2.5.1 Capping of masonry units without voids or with voids unfilled

Use a cement/sand capping mortar expected to attain a minimum compressive strength, when tested in accordance with EN 1015-11, at the time of testing the specimens, at least that of the expected masonry unit strength or 30 N/mm², whichever is the lesser.

If necessary, e.g. for units with high water absorption characteristics, first moisten the surfaces to be capped. Bed each specimen on a smooth rigid plate of ground glass or stainless steel which does not depart from a true plane surface by more than 0,1 mm in any 100 mm. A suitable method is as follows: