

BS EN 771-1 European Standard Specification for clay masonry units
compared to BS 3921 British Standard Specification for Clay Bricks

October 2003

TECHNICAL SERVICES

BS3921 - Durability

FL	Frost resistant (F)	Low (L)
FN	Frost resistant (F)	Normal (N)
ML	Moderately frost resistant (M)	Low (L)
MN	Moderately frost resistant (M)	Normal (N)
OL	Not frost resistant (O)	Low (L)
ON	Not frost resistant (O)	Normal (N)

Frost Resistance

Bricks are placed into one of three categories

Frost resistant – bricks durable in all normal building conditions when in a saturated condition subjected to continuous freezing and thawing.

Moderately frost resistant – bricks durable except in a saturated condition subjected to continuous freezing and thawing.

Not frost resistant – Suitable for indoor use or under impermeable cladding. These bricks may suffer damage during and after construction if not properly protected.

Soluble Salts Content

Bricks are placed into one of two categories

Low- The percentage by mass of soluble ions shall not exceed Magnesium-0.030%, potassium-0.030% and sodium 0.030%. Sulphate content 0.500%

Normal- The percentage by mass of soluble ions shall not exceed Magnesium, potassium and sodium 0.25% in total. Sulphate content 1.6%

BS EN771-1

Freeze-thaw resistance and Active Soluble Salt content

Unlike BS 3921, where durability incorporated both frost resistance and soluble salts content, BS EN 771-1 states that freeze-thaw resistance and active soluble salts content are separately categorized.

Freeze/thaw resistance

This should be declared by the manufacturer with reference to performance under passive, moderate or severe exposure.

F0 – Suitable for Passive exposure.

F1 – Suitable for Moderate exposure.

F2 – Suitable for Severe exposure.

Active soluble salt content

No requirement for completely protected walls otherwise: When sampled and tested in accordance with EN772-5 the content of water soluble salts should be no greater than tabled

Category	Total % by mass not greater than	
	Na+ + K+	Mg ²
SO	No requirement	No requirement
S1	0,17	0,08
S2	0,06	0,03

BS 3921 COMPRESSIVE STRENGTH

The Compressive Strength of a brick should not be less than that stated by the manufacturer. The minimum strength is 5N/mm². However Class B Engineering Bricks must be => 50N/mm² and Class A Engineering Bricks must be =>70 N/mm².

WATER ABSORPTION

The water absorption should not be greater than that stated by the manufacturer and there is no maximum or minimum requirement for facing bricks.

Test involves placing in boiling water for 5 hours.

Dpc 2 bricks (for damp course use in garden walls etc) and Dpc1 bricks (for use in walls in habitable buildings) have the same requirements for Water Absorption as shown for Class 'B's' and 'A's' respectively.

Class 'B's' should be =< 7% and Class 'A's' should be =< 4.5%.

BS EN 771-1 COMPRESSIVE STRENGTH

Must be declared by the manufacturer. The results are recorded in N/mm².

The test involves grinding the surfaces smooth if they vary in height more than 1mm per 100mm from a level plane. Alternatively the unit can be bedded in mortar to achieve a flat plane if grinding would alter the contact area significantly.

There are no classes. Engineering bricks will be referenced in the UK National Annex to 771-1.

The orientation of the unit should be indicated e.g. frog up or down and whether voids are intended to be mortar filled. If the units are intended to be exposed to concentrated loads or for use in seismic areas, any strength result from the batch tested that falls below 80% of the stated strength must be declared.

Must not fall below strength stated by the manufacturer who must also categorise the unit into:

Category I (probability of failure not exceeding 5%) or **Category II**. (the level of confidence as placed on category I does not apply)

WATER ABSORPTION

For facing bricks, the mean water absorption should be declared by the manufacturer, when tested the mean should not be greater than the declared value. The test now involves soaking for 24 hours.

DPC bricks

For DPC bricks the mean water absorption should be declared by the manufacturer. The mean should not be greater than the declared water absorption and the test involves placing in boiling water for 5 hours.

BS 3921 Size of Voids

Solid bricks have no perforations or frogs. Perforated bricks have holes not exceeding 25% of the gross volume of brick. The area of any one hole should not exceed 10% and the amount of solid clay across the width should not be less than 30%.

Frogged bricks may have depressions in one or more of the beds but this should not exceed 20% of the gross volume of the brick.

BS EN 771-1 Size of voids -Percentage of voids Configuration –(Geometry shape and features)

The shape of the brick and direction of any perforations should be stated. The number of perforations, the volume and shape of these and frogs and the thickness of the shells and webs should be stated if the product is to be specified for acoustic requirements, or for calculating thermal performance, fire resistance or certain applications e.g. chimneys or seismic zones. An illustration of configuration would be acceptable or a declaration using the definitions given. Minimum thickness shall be measured in the rendering keyways if applicable. There are no tolerances specified related to volume of perforations or frogs.

BS 3921 - SIZES

A one-size standard work size of 215 x 102.5 x 65mm. The work size shall not exceed the coordinating size, which includes 10mm mortar joints.

Dimensional deviations.

Combined measurements of 24 bricks should not fall outside the limits stated.

Measurement Procedure

Take 24 bricks and remove any flakes and blisters. Place bricks header to header on a clean level surface. Measure overall length to the nearest mm using a steel tape. (Alternatively measure two rows of 12 and add them together. Do not measure 12 and then double the figure). Repeat the process for width and height. It should be noted that all of the bricks should face a common direction for each measurement.

EN 771-1 DIMENSIONS AND TOLERANCES

HD UNITS (High gross dry density - unprotected masonry)

Dimensions

The manufacturer should declare the work size in order of length, width and height in mm. The deviation category for the mean values must also be stated. Additionally when relevant to the uses for which the unit is put on the market, the manufacturer shall declare which of the tolerance categories for range in 5.3.1.2 a given consignment of clay masonry units fulfils. i.e. Range requirements are optional.

TOLERANCES

Mean value (means of 10 bricks)

The difference in value between the declared value and the mean value should not be greater than the figures tabled for UK – size products, and derived from the formulae given. e. g work size mm

	215	102	65
T1	±6	±4	±3
T2	±4	±3	±2
Tm	Deviation declared by manufacturer		

Range

The maximum range (difference between largest and smallest measurement) for any given dimension on the batch of 10 sampled should be within one of the 3 categories tabled e. g work size mm

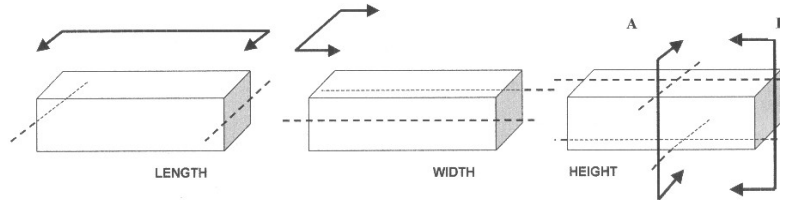
	215	102	65
R1	9	6	5
R2	4	3	2
Rm	Range declared by manufacturer.		

T2 R2 would be the tightest tolerance to quote unless manufacturers declaration was tighter.

Measurement procedure

For bricks smaller than 250 x 125 x 100mm. Using long nose callipers remove any surplus flakes etc. Using procedure b of EN772-16 one measurement each should be taken from the centre of the brick for length and width.

For height, measurements should be taken from positions A and B and the mean worked out from the two.



BS 3921 INITIAL RATE OF SUCTION

This test measures how quickly water is absorbed into the brick, which gives some idea of whether or not adjustment is necessary to achieve maximum bond strength. The result is in kg/m²/min.

EN 771-1 INITIAL RATE OF WATER ABSORPTION

When relevant for the intended use the range of initial rate of water absorption of a consignment of clay masonry units shall be declared by the manufacturer. Results in kg/m²/min.

No guidance is given on application.

EN 771-1 other requirements not in BS 3921

Dry Density

When relevant to the uses for which the unit is put on the market and in all cases for masonry units intended to be used in elements subject to acoustic requirements, the gross and dry density of clay masonry units shall be declared by the manufacturer.

When clay masonry units are sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-13, the mean gross or net dry density derived from measurements of the test sample shall not differ from the manufacturers declared dry density by more than the declared one of the following categories.

D1: 10%

D2: 5%

Dm: a deviation in % declared by the manufacturer (may be wider or closer than other categories)

Thermal properties (optional)

When relevant to the uses for which the unit is put on the market and in all cases for masonry units intended to be used in elements subject to thermal insulation requirements, the manufacturer shall provide information on the thermal properties of the masonry unit. When this is the case it shall be done by reference to EN 1745. It shall be declared whether the declaration is based on a table, test or calculation.

Moisture Movement (optional)

In countries where there is a requirement it shall be evaluated and declared to the provisions valid in the intended place of use.

Reaction to fire (optional)

For designs subject to fire regulations. For units containing less than 1% by mass or volume of added or naturally present carboniferous materials, these can be a class A1 with no need for testing.

Units containing greater than 1% should be tested and classified according to prEN13501-1

Water vapour permeability (optional)

For units intended for external elements the manufacturer shall provide information on the water vapour permeability through the water vapour diffusion coefficient tabulated values given in EN1745.

Bond strength (optional)

The bond strength in combination with mortar shall be declared either by means of tests carried out or from a declared value found in BS EN998-2, which is 0.15 N/mm² (the characteristic initial shear strength).