MICHELMERSH
Britain's Brick Specialists

DURABILITY DEFINITION AND SIZE TOLERANCES UNDER BS EN 771-1

INTRODUCTION

This document provides information on all standard brick products that are supplied to the EN 771-1 Specifications for Clay Masonry Units.

This is a common European standard that covers a wide range of types of clay masonry units.

GENERAL

Facing bricks fall into the "Unprotected" brickwork category (U) – Bricks intended for use in brickwork with direct exposure to weather.

The other category of "Protected" (P), deals with products intended for non-exposed use such as under render or internal walls, generally represented by hollow clay blocks, used extensively in continental Europe.

DURABILITY

Whilst durability testing is carried out by subjecting bricks to a repeated freeze thaw test, suitability for an application is often defined as a combination of Frost Resistance and Soluble Salts. (High salts content can affect the structural integrity of brickwork in exposed situations).

EN 771-1 uses a Letter to define the property being specified and numbers to define the level achieved in testing:

DURABILITY (FREEZE/THAW) F
F2 = Frost Resistant - Suitable for Severe Exposure
F1 = Moderate Frost Resistance - Suitable for Moderate Exposure
F0 = Not Frost Resistant – Suitable only for Passive Exposure

ACTIVE SOLUBLE SALTS; S
S2 = Low Soluble Salts, $Na^+ + K^+$ <=0.06%, Mg^{2+} <=0.03%, by mass.
S1 = Normal Sol. Salts, $Na^+ + K^+$ <=0.17%, Mg^{2+} <=0.08%, by mass.
S0 = No Requirement to Declare - This only applies if the product is specifically intended for protected non-exposed use.

Therefore, the highest specification under EN 771-1 is F2, S2 (i.e. Fully Frost Resistant and Low Salts).

EN771-1 Annex B3.2 Masonry Subject to Severe Exposure is described as;

- Unrendered masonry near to external ground level (approximately two courses above and below) where saturation with freezing can occur;
- Unrendered parapets where saturation with freezing can occur, e.g. where the parapet is not provided with an effective coping;
- Unrendered external chimney masonry where saturation with freezing can occur;
- Cappings, copings, and sills in areas where freezing conditions can occur;
- Freestanding boundary and screen walls where saturation with freezing can occur, for example if the wall is not provided with an effective coping;
- Earth retaining walls where saturation with freezing will occur for example where the wall has not been provided with an effective coping or a water proofing treatment on the retaining face.

EFFLORESCENCE

The old efflorescence test used in BS 3921 was inconsistent and unreliable, so in 1995 was discontinued and replaced by the EN771-1 measure of active soluble salts.

The old British Standard, BS 3921, used letters to describe the results of testing These were;

F = Frost Resistant, M = Moderate Frost Resistance, **O** = Not Frost Resistant

L = Low Soluble Salts, **N** = Normal Soluble Salts

FL being the highest specification

Despite this standard being replaced over 10 years ago, this designation is still referred to by some clients.

DIMENSIONS

EN 771-1 defines dimensional tolerances in a similar fashion to that above, using letters and numbers.

T2 = Tightest tolerance.
T1 = Wider Tolerance.
Tm = Manufacturer Defined Tolerance. This could be any tolerance as declared by the manufacturer. Usually used for bricks that don't comply with T1.

Actual tolerance values are calculated using the formulas;
T2 = ± 0.25 x $\sqrt{Work\ dimension}$ or 2 mm, whichever is greater
T1 = ± 0.40 x $\sqrt{Work\ dimension}$ or 3 mm, whichever is greater

e.g. For a 215 mm Dimension ; $\sqrt{215}$ = 14.66

T2 = 0.25 x 14.66 = ± 4 mm, based on 10 individual brick measurements
T1 = 0.40 x 14.66 = ± 6 mm, based on 10 individual brick measurements

A significant addition in EN 771 was the concept of a Range Tolerance classification. This is effectively the difference in size between the largest and smallest bricks in a 10 brick sample.

This is defined as;

R2 = Tightest Range - This is tight for normal clay facing bricks.
R1 = Wider Range
Rm = Manufacturer Defined Range. This could be any value as declared by the Manufacturer, usually used for bricks that don't comply with R1.

Actual tolerance values are calculated using the formulas;
R2 = 0.30 x $\sqrt{Work\ dimension}$
R1 = 0.60 x $\sqrt{Work\ dimension}$

e.g. For a 215 mm Dimension ; $\sqrt{215}$ = 14.66

R2 = 0.30 x 14.66 = 4 mm, based on 10 individual brick measurements
R1 = 0.60 x 14.66 = 9 mm, based on 10 individual brick measurements