(b) Characteristic compressive strength

Three methods for determining the compressive strength of unreinforced masonry are set out. The first, designated as a principle, states that this shall be determined from the results of tests on masonry. A subsidiary note indicates that such results may be available nationally or from tests carried out for the project. The second method, not designated as a principle, appears to be an elaboration of the first in specifying that tests should be carried out according to EN 1052–1 or from an evaluation of test data in a similar way to that prescribed in the third method.

According to the latter, which may be used in the absence of specific test results or national data, a formula is given, for masonry built with general-purpose mortar, relating unit and mortar strengths to masonry characteristic strength with adjustment for unit proportions and wall characteristics. This formula is as follows:

$$f_k = K f_b^{0.65} f_m^{0.25} \text{ N/mm}^2 \tag{4.10}$$

where f_k is the characteristic masonry strength, f_b is the normalized unit compressive strength, f_m is the specified compressive strength of mortar and K is a constant depending on the construction.

The normalized unit compressive strength is introduced in an attempt to make the formula apply to units of different geometric proportions by making f_b in the formula equivalent to the strength of a 100mm cube. This is achieved by the use of the factor δ in Table 4.6.

Values of K range from 0.6 to 0.4. The higher value applies to masonry in which the wall thickness is equal to the width of the unit and which in this case is of category I in terms of quality control in manufacture. The lower value applies to masonry in which there is a longitudinal joint in the thickness of the wall, and built of category 2b or 3 units. Intermediate values are given for other cases.

Other formulae are suggested for masonry built with thin-layer or lightweight mortar and for shell-bedded, hollow block masonry.

Table 4.6 Values of factor δ [a] (EC6)

Height of unit (mm)	*Least horizontal dimension of unit* (mm)				
	50	100	150	200	250 *or greater*
50	0.85	0.75	0.70	–	–
65	0.95	0.85	0.75	0.70	0.65
100	1.15	1.00	0.90	0.80	0.75
150	1.30	1.20	1.10	1.00	0.95
200	1.45	1.35	1.25	1.15	1.10
250 or greater	1.55	1.45	1.35	1.25	1.15

[a] Linear interpolation is permitted.

It is likely that National Application Documents will prescribe masonry compressive strengths in accordance with experience in the country for which each is issued.

(c) Characteristic shear strength of unreinforced masonry

The characteristic shear strength of unreinforced masonry is to be determined in a similar way to compressive strength, that is on the basis of tests, the results of which may be available nationally, or from tests conducted according to European standards or from the following formulae:

$$f_{vk} = f_{vk0} + 0.4\,\sigma_d \tag{4.11}$$

or

$$f_{vk}=0.065f_b \text{ but not less than } f_{vk0}$$

or

$$f_{vk}=\text{limiting value given in Table 4.7}$$

where f_{vk0} is the shear strength under zero compressive stress or, for general-purpose mortars, the value shown in Table 4.7, σ_d is the design compressive stress normal to the shear stress and f_b is the normalized compressive strength of the units.

Where national data are not available or where tests in accordance with European standards have not been carried out, the value of f_{vk0} should be taken as 0.1 N/mm^2.

Other values are given for masonry in which the vertical joints have not been filled and for shell-bedded blockwork.

(d) Flexural strength of unreinforced masonry

The flexural strength of unreinforced masonry is again to be determined by tests or on the basis of national data. Flexural strength is only to be relied upon in the design of walls for resistance to transient actions, such as wind loads.

No values are suggested and it is assumed that these will be specified in National Application Documents.

(e) Anchorage bond strength of reinforcement in infill and in mortar

Values are quoted for anchorage bond strength for plain and high-bond carbon steel and stainless steel embedded in infill concrete and in mortar. These values are higher where the infill concrete is confined within masonry units.