In using different materials in combination, e.g. clay bricks and concrete blocks, it is necessary to exercise considerable care to allow differential movements to take place. Thus the code suggests that more flexible wall ties may be substituted for the normal vertical twist ties in cavity walls in which one leaf is built in brickwork and the other in blockwork.

4.2.3 Sections 3 and 4: design

Sections 3 and 4 contain the main design information, starting with a statement of the basis of design. Unlike its predecessor, CP111, BS 5628 is based on limit state principles.

It is stated that the primary objective in designing loadbearing masonry members is to ensure an adequate margin of safety against the attainment of the ultimate limit state. In general terms this is achieved by ensuring that

$$\text{design strength} \geqslant \text{design load}$$

As stated in Chapter 1, the term *design load* is defined as follows:

$$\text{design load} = \text{characteristic load} \times \gamma_f$$

where γ_f is a partial safety factor introduced to allow for (a) possible unusual increases in load beyond those considered in deriving the characteristic load, (b) inaccurate assessment of effects of loading and unforeseen stress redistribution within the structure, and (c) variations in dimensional accuracy achieved in construction.

As a matter of convenience, the γ_f values have (see Table 4.1) been taken in this code to be, with minor differences, the same as in the British code for structural concrete, CP 110:1971. The effects allowed for by (b) and (c) above may or may not be the same for masonry and concrete. For example, structural analysis methods normally used for the design of concrete structures are considerably more refined than those used for masonry structures. Dimensional accuracy is related to the degree of supervision applied to site construction, which is again normally better for concrete than for masonry. There is, however, no reason why more accurate design methods and better site supervision should not be applied to masonry construction, and as will be seen presently the latter is taken into account in BS 5628 but by adjusting the material partial safety factor γ_m rather than γ_f.

As explained in Chapter 1, characteristic loads are defined theoretically as those which will not be exceeded in 95% of instances of their application, but as the information necessary to define loads on a statistical basis is seldom available, conventional values are adopted from relevant codes of practice, in the present case from the British Standard Codes of Practice CP 3, Chapter V.

Table 4.1 Partial safety factors in BS 5628

(A) *Partial safety factors for loads* (γ_f)

(a) *Dead and imposed load*

$$\text{design dead load} = 0.9\,G_k \text{ or } 1.4\,G_k$$
$$\text{design imposed load} = 1.6\,Q_k$$

(b) *Dead and wind load*

$$\text{design dead load} = 0.9\,G_k \text{ or } 1.4\,G_k$$
$$\text{design wind load} = 1.4\,W_k \text{ or } 0.015\,G_k \quad \text{(whichever is the larger)}$$

In the particular case of free-standing walls and laterally loaded wall panels, whose removal should in no way affect the stability of the remaining structure, γ_f applied on the wind load may be taken as 1.2.

(c) *Dead, imposed and wind load*

$$\text{design dead load} = 1.2\,G_k$$
$$\text{design imposed load} = 1.2\,Q_k$$
$$\text{design wind load} = 1.2\,W_k \text{ or } 0.015\,G_k \quad \text{(whichever is the larger)}$$

(d) *Accidental damage*

$$\text{design dead load} = 0.95\,G_k \text{ or } 1.05\,G_k$$
$$\text{design imposed load} = 0.35\,Q_k \quad \text{(except that, in the case of buildings used predominantly for storage, or where the imposed load is of a permanent nature, } 1.05\,Q_k \text{ should be used)}$$
$$\text{design wind load} = 0.35\,W_k$$

Here G_k is the characteristic dead load, Q_k is the characteristic imposed load, W_k is the characteristic wind load, and the numerical values are the appropriate γ_f factors.

(B) *Partial safety factors for materials* (γ_m)

		Category of construction control	
		Special	*Normal*
Category of manufacturing Control	Special	2.5	3.1
	Normal	2.8	3.5

Different values of γ_f are associated with the various loading cases. Reduced values are specified for accidental damage.

Turning now to the other side of the limit state equation, the term *design strength* is defined as:

$$\text{design strength} = \text{characteristic strength} / \gamma_m$$