4.3.1 Section 1: general

This section lists additional definitions and symbols relating to reinforced and prestressed masonry and notes that the partial safety factors given for this type of construction assume that the special category of construction control specified in Part 1 will apply. If this is not possible in practice, then higher partial safety factors should be used.

4.3.2 Section 2: materials and components

References are given to relevant standards for masonry units, reinforcing steel, wall ties and other items. Requirements for mortar and for concrete infill are stated. Mortar designations (i) and (ii) as in Part 1 are normally to be used but designation (iii) mortar may be used in walls in which bed-joint reinforcement is placed to increase resistance to lateral loading.

A suitable concrete mix for infill in reinforced masonry is given as $1{:}0{-}\frac{1}{4}{:}3{:}2$, cement:lime:sand:10mm maximum size aggregate. Other infill mixes for pre- and post-tensioned masonry are quoted with reference to the relevant British Standard, BS 5328, for specifying concrete mixes. Recommendations for admixtures of various kinds are also given.

4.3.3 Section 3: design objectives

As in Part 1, this section sets out the basis of design in limit state terms, including values for characteristic strength of materials and partial safety factors.

In unreinforced brickwork, serviceability limit states rarely require explicit consideration but deflection and cracking may be limiting factors in reinforced or prestressed work. Thus it is suggested that the final deflection of all elements should not exceed length/125 for cantilevers or span/250 for all other elements. To avoid damage to partitions or finishes the part of the deflection taking place after construction should be limited to span/500 or 20mm and the upward deflection of prestressed members before the application of finishes should not exceed span/300. A general requirement is stated that cracking should not adversely affect appearance or durability of a structure.

Characteristic strengths of brickwork in compression follow Part 1 with an additional clause covering the case in which compressive forces act parallel to the bed faces of the unit. As indicated in section 3.2.6 of the code the characteristic strength of brickwork stressed in this way may have to be determined by test if cellular or perforated bricks are used. The code suggests a lower-bound value of one-third of the normal strength if test data are not available.

Shear strength for brickwork sections reinforced in bed or vertical joints is given as 0.35 N/mm^2. In the case of grouted cavity or similar sections, this value is augmented by 17.5 ρ, where ρ is the steel ratio. To allow for the increased shear strength of beams or cantilever walls where the shear span ratio *(a/d)* is less than 6, the characteristic shear strength may be increased by a factor [2.5-0.25*(a/d)*] up to a maximum of 1.7N/mm^2.

Racking shear strength for walls is the same as for unreinforced walls except that in walls in which the main reinforcement is placed within pockets, cores or cavities the characteristic shear strength may be taken as 0.7N/mm^2, provided that the ratio of height to length does not exceed 1.5.

For prestressed sections, the shear strength is given as f_v=(0.35+0.6g) N/mm^2, where g is the design load acting at right angles to the bed joints, including prestressing loads. If, however, the prestressing force acts parallel to the bed joints, g=0 and f_v=0.35N/mm^2. These values may again be increased when the shear span ratio is less than 6.

The characteristic tensile strength of various types of reinforcing steel is as shown in Table 2.9.

As it will be necessary in some cases to check deflections of reinforced and prestressed elements, values are given for the elastic moduli of the various materials involved. For brickwork under short-term loading E=0.9f_k kN/mm^2 and for long-term loading 0.45f_k kN/mm^2 for clay brickwrork and 0.3/f_kkN/mm^2 for calcium silicate brickwork. The elastic modulus of concrete infill varies with the cube strength as shown in Table 4.3.

Partial safety factors are generally as in Part 1, but with the addition of ultimate limit state values of 1.5 and 1.15 for bond strength between infill and steel and for steel, respectively. It is assumed that the 'special' category of construction control will normally apply to reinforced and prestressed work.

4.3.4 Section 4: design of reinforced masonry

Section 4 is subdivided into paragraphs dealing with the design of elements subjected to bending, combined vertical loading and bending, axial compressive loading and horizontal forces in their own plane. The principles underlying the design methods and formulae are the same as for reinforced concrete, with suitable modifications to allow for differences in material properties. The formulae given for the design of simply reinforced, rectangular beams allow for flexural failure by yielding of the steel with a cut-off to exclude brittle failures. These principles and related formulae will be discussed in detail in Chapter 10 along with examples of their application.