

**Table 4.3** Elastic modulus for concrete infill

28-day cube strength (N/mm <sup>2</sup> )	20	30	40	50	60
E (kN/mm <sup>2</sup> )	24	26	28	30	32

A final subsection of Section 4 gives recommendations for reinforcement details.

#### **4.3.5 Section 5: design of prestressed masonry**

The design methods given in this section for prestressed elements are again similar to those which have been developed for prestressed concrete. Calculation of the moment of resistance at the ultimate limit state is to be based on the assumption of linear strain distribution and a rectangular stress block in the compression zone, omitting the tensile strength of the masonry.

Design for the serviceability limit state is provided for by limiting the compressive stresses at transfer of the prestressing force and after all losses have occurred. Calculation of tendon forces must allow for loss of prestress resulting from a variety of causes and information is provided on which to base these estimates. Finally, a short subsection gives rules for detailing anchorages and tendons.

Experience in the use of prestressed brickwork on which the code has to be based is more limited than for reinforced brickwork and therefore the provisions of this part of the document are necessarily less detailed and in some cases rather tentative.

#### **4.3.6 Sections 6 and 7: other design considerations and work on site**

Section 6 of the code deals with the important matter of durability and, specifically, with the selection of material for avoidance of corrosion of reinforcement in various conditions of exposure, as defined in Part 3 of BS 5628. Where carbon steel is used, minimum concrete cover for these exposure conditions is specified.

Section 7, dealing with work on site, also refers to Part 3 of BS 5628 and gives additional guidance on a number of matters specifically relating to reinforced and prestressed work, such as the procedures to be adopted in filling cavities in grouted cavity, Quetta bond or similar forms of construction. It is again stated that the special category of construction control should be specified for this type of work.

#### 4.4 DESCRIPTION OF EUROCODE 6 PART 1-1 (ENV 1996-1-1:1995)

Eurocode 6 is one of a group of standards for structural design being issued by the Commission of the European Communities. It was published in draft form in 1988 and, following a lengthy process of comment and review, the first part was issued in 1995 as a 'pre-standard' or ENV under the title *Part 1-1: General rules for buildings. Rules for reinforced and unreinforced masonry*. Following a trial period of use on a voluntary basis, the document will be reissued as a Eurocode, taking account of any amendments shown to be necessary. Other parts of EC6 dealing with special aspects of masonry design are being prepared or are planned. Eurocodes for the various structural materials all rely on EC1 for the specification of the basis of design and actions on structures.

EC6 Part 1-1 is laid out in the following six sections:

- *Section 1. General*
- *Section 2. Basis of design*
- *Section 3. Materials*
- *Section 4. Design of masonry*
- *Section 5. Structural detailing*
- *Section 6. Construction*

The clauses in ENV 1996-1-1 are of two categories, namely, 'Principles', designated by the letter P, and 'Application rules'. In general, no alternatives are permitted to the principles but it is permissible to use alternatives to the application rules, provided that they accord with the principles.

A further point to be noted in using the code is that many of the values for material strengths and partial safety factors are shown 'boxed'. This is because national authorities have responsibility for matters affecting safety and may, in an accompanying National Application Document, specify values which differ from the indicative figures shown in the ENV.

The following paragraphs give a summary of the content of ENV 1996-1-1 but careful study of its lengthy and complex provisions are necessary before attempting to use it in design.

##### 4.4.1 Section 1: general

The scope of EC6 extends to the design of unreinforced, reinforced and prestressed masonry and also to what is called 'confined' masonry, which is defined as masonry enclosed on all four sides within a reinforced concrete or reinforced masonry frame (steel frames are not mentioned).

It is assumed that structures are designed and built by appropriately qualified and experienced personnel and that adequate supervision