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Reinforced masonry

10.1 INTRODUCTION

Possible methods of construction in reinforced masonry (illustrated in Fig. 10.1) may be summarized as follows:

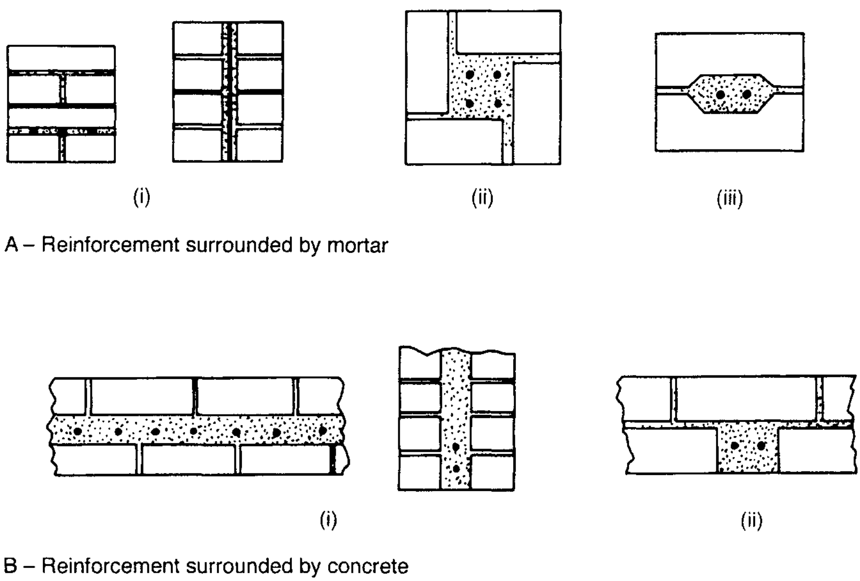

Fig. 10.1 Methods of reinforcing brickwork.

(A) Reinforcement surrounded by mortar
  (i) in bed joints or collar joints
  (ii) in pockets formed by the bond pattern of units
  (iii) in pockets formed by special units
(B) Reinforcement surrounded by concrete
  (i) in cavity between masonry leaves

(ii) in pockets formed in the masonry
(iii) in the cores of hollow blocks
(iv) in U-shaped lintel units

Type A(i) is suitable for lightly reinforced walls when the steel is placed in the bed joints, for example to improve the resistance of a wall to lateral loading. Larger-diameter bars or reinforcement in two directions can be accommodated when the steel is placed in the collar joint of a stretcher bond wall. Such an arrangement is suitable for a shear wall. Type A(ii) includes Quetta bond and may be used as a means of introducing steel for controlling earthquake or accidental damage. The use of specially shaped units produces a similar result. In these methods the steel is placed and surrounded by mortar as the work proceeds.

In types B(i) and (ii) the spaces for the reinforcing bars are larger and are filled with small aggregate concrete. Types B(iii) and (iv) are used for reinforced concrete blockwork, vertically and/or horizontally reinforced. In this case, the cavity pockets or cores may be filled as the masonry is laid in lifts up to 450 mm in height or, alternatively, walls may be built up to 3 m height before placing the infill concrete. In the latter case, provision has to be made for cleaning debris from the internal spaces before filling with concrete. This technique is suitable for walls, beams and columns and can accommodate any practicable amount of reinforcement. In particular, grouted cavity beams can be reinforced with vertical and diagonal bars for shear resistance.

10.2 FLEXURAL STRENGTH

10.2.1 Stress-strain relationships

In order to develop design equations for elements subject to bending it is necessary to assume ideal stress-strain relationships for both the masonry and the reinforcement.

As far as the masonry is concerned the approximate parabolic distribution shown in Fig. 3.5 may be further simplified to a rectangular distribution in which the stress is assumed to be constant and equal to f_k/γ_{mm}, (Fig. 10.2).

As far as the steel is concerned the relationship is assumed to be as shown in Fig. 10.3 where f_y, the characteristic tensile strength of the reinforcement, is assumed to be 250 N/mm^2 for hot-rolled deformed high-yield steel and 460 N/mm^2 for hot-rolled plain, cold-worked steel and stainless-steel bars.