

Recent research (Fig. 2.5) has shown that the water/cement ratio is the most important factor which affects the compressive strength of grades I, II and III mortars. In principle, therefore, it would be advisable for the structural engineer to specify the water/cement ratio for mortar to be used for structural brickwork; but, in practice, the water/cement ratio for a given mix will be determined by workability. There are various laboratory tests for measuring the consistency of mortar, and these have been related to workability. Thus in the United Kingdom, a dropping ball test is used in which an acrylic ball of 10 mm diameter is dropped on to the surface of a sample of mortar from a height of 250 mm. A ball penetration of 10 mm is associated with satisfactory workability. The test is, however, not used on site, and it is generally left to the bricklayer to adjust the water content to achieve optimum workability. This in fact achieves a reasonably consistent water/cement ratio which varies from one mix to another. The water/cement ratio for 10mm ball penetration, representing satisfactory workability, has been indicated in Fig. 2.5 for the three usual mortar mixes.

It is important that the practice of adding water to partly set mortar to restore workability (known as 'knocking up' the mix) should be prevented.

2.11 CHOICE OF UNIT AND MORTAR

Table 2.7 shows the recommended minimum quality of clay or calcium silicate or concrete bricks/blocks and mortar grades which should be used in various situations from the point of view of durability.

2.12 WALL TIES

In the United Kingdom, external cavity walls are used for environmental reasons. The two skins of the wall are tied together to provide some degree of interaction. Wall ties for cavity walls should be galvanized mild steel or stainless steel and must comply to BS 1243. Three types of ties (Fig. 2.6) are used for cavity walls.

- Vertical twist type made from 20 mm wide, 3.2 to 4.83 mm thick metal strip
- 'Butterfly'—made from 3.15 mm wire
- Double-triangle type—made from 4.5 mm wire.

For loadbearing masonry vertical twist type ties should be used for maximum co-action. For a low-rise building, or a situation where large differential movement is expected or for reason of sound insulation, more flexible ties should be selected. In certain cases where large differential movements have to be accommodated, special ties or fixings have to be used (see Chapter 13). In specially unfavourable situations

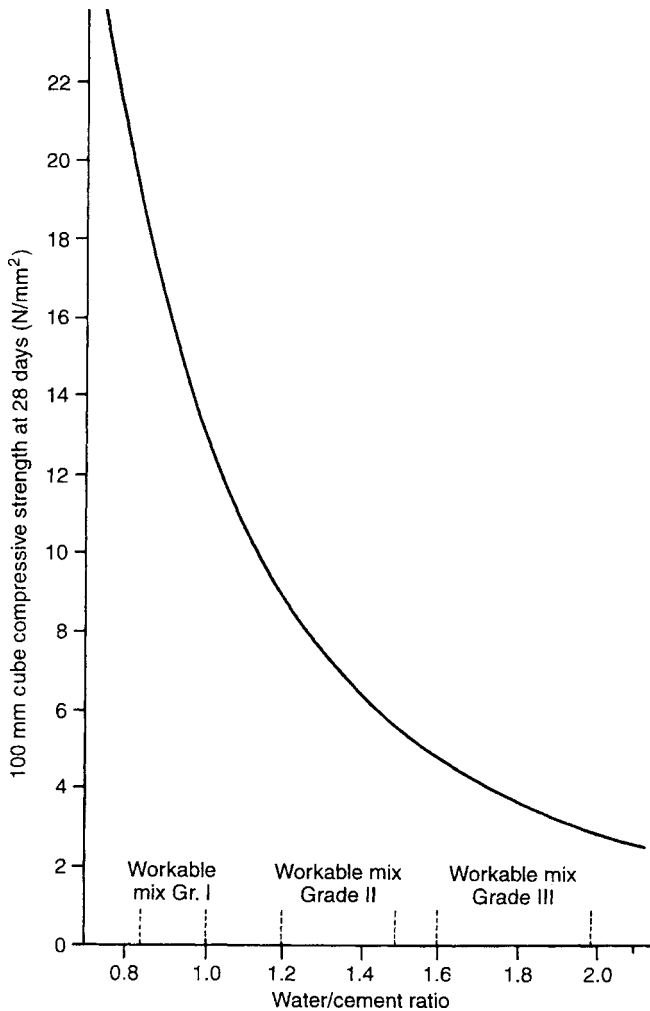


Fig. 2.5 Effect of water/cement ratio on the compressive strength of mortar of grades I, II and III.

non-ferrous or stainless-steel ties may be required. BS 5628 (Table 6) gives guidance for the selection and use of ties for normal situations.

2.13 CONCRETE INFILL AND GROUT

The mix proportion by volume for reinforced and prestressed masonry should be 1:0 to 1:3:2 cement:lime:sand:10 mm maximum size aggregate.