

*(b) Bed joints of excessive thickness*

It was pointed out in discussing the compressive strength of brickwork that increase in joint thickness has the effect of reducing masonry strength because it generates higher lateral tensile stresses in the bricks than would be the case with thin joints. Thus, bed joints of 16–19 mm thickness will result in a reduction of compressive strength of up to 30% as compared with 10mm thick joints.

*(c) Deviation from verticality or alignment*

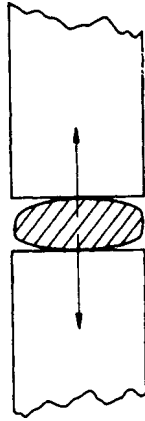
A wall which is built out of plumb, which is bowed or which is out of alignment with the wall in the storey above or below will give rise to eccentric loading and consequent reduction in strength. Thus a wall containing a defect of this type of 12–20 mm will be some 13–15% weaker than one which does not.

*(d) Exposure to adverse weather after laying*

Newly laid brickwork should be protected from excessive heat or freezing conditions until the mortar has been cured. Excessive loss of moisture by evaporation or exposure to hot weather may prevent complete hydration of the cement and consequent failure to develop the normal strength of the mortar. The strength of a wall may be reduced by 10% as a result. Freezing can cause displacement of a wall from the vertical with corresponding reduction in strength. Proper curing can be achieved by covering the work with polythene sheets, and in cold weather it may also be necessary to heat the materials if bricklaying has to be carried out in freezing conditions.

*(e) Failure to adjust suction of bricks*

A rather more subtle defect can arise if slender walls have to be built using highly absorptive bricks. The reason for this is illustrated in [Fig. 3.6](#), which suggests how a bed joint may become ‘pillow’ shaped if the bricks above it are slightly rocked as they are laid. If water has been removed from the mortar by the suction of the bricks, it may have become too dry for it to recover its originally flat shape. The resulting wall will obviously lack stability as a result of the convex shape of the mortar bed and may be as much as 50% weaker than should be expected from consideration of the brick strength and mortar mix. The remedy is to wet the bricks before laying so as to reduce their suction rate below  $2\text{kg}/\text{m}^2/\text{min}$ , and a proportion of lime in the mortar mix will help to retain water in it against the suction of the bricks.



**Fig. 3.6** Effect of moisture absorption from mortar bed. Movement of bricks after laying results in 'pillow' shaped mortar bed.

*(f) Incorrect proportioning and mixing of mortar*

The effect of mortar strength on the strength of masonry may be judged from Fig. 3.1 from which it may be seen with bricks having a crushing strength of  $50\text{N/mm}^2$  that reducing the mortar strength from  $11\text{N/mm}^2$  to  $4.5\text{N/mm}^2$  may be expected to reduce the brickwork strength from  $14\text{N/mm}^2$  to  $11\text{N/mm}^2$ . This corresponds to a change in mortar mix from 1:3 cement:sand to 1:4.5 or about 30% too little cement in the mix. A reduction in mortar strength could also result from a relatively high water/cement ratio whilst still producing a workable mix. It is therefore important to see that the specification for mortar strength is adhered to although there is an inherent degree of tolerance sufficient to accommodate small errors in proportioning and mixing the mortar. The use of unsuitable or an excessive amount of plasticizer in place of lime will produce a porous and possibly weak mortar and has to be guarded against.

### 3.6.2 Workmanship defects in concrete blockwork

Most of the studies on the effect on the compressive strength of masonry, on which the above discussion is based, have been carried out on clay brickwork walls. Some of the factors described, however, apply also to concrete blockwork including the need to fill bed joints and for walls to be built accurately in terms of verticality, planeness and alignment. Excessively thick joints are less likely to be significant in blockwork but the need to meet the specified mortar mix or strength is equally important. Protection against adverse weather conditions is again necessary.