(Note that in BS 5628 the symbol α is used for bending moment coefficient.)

From equation (7.24)

$$\beta=\frac{K}{4\mu\alpha^2}\left[\left(\frac{6\mu\alpha^2}{K}+1\right)^{1/2}-1\right]$$

$$=\frac{1}{4\times 3.33\times(0.75)^2}\left[\left(\frac{6\times 3.33\times(0.75)^2}{1}+1\right)^{1/2}-1\right]=0.3334$$

From equation (7.23) vertical moment

$$m=\frac{w\alpha^2L^2}{6}\left(\frac{1.5\beta-\beta^2}{1+4\mu\beta\alpha^2/K}\right)$$

$$=\frac{wL^2}{6}\times(0.75)^2\left(\frac{1.5\times 0.3334-(0.3334)^2}{1+4\times 3.33\times 0.3334\times(0.75)^2/1}\right)=0.0104\,wL^2$$

therefore horizontal moment

$$\mu m=0.0104\times 3.33wL^2=0.035wL^2$$

The bending moment coefficient from BS 5628 for the corresponding case (*hlL*=0.75) is also 0.035.

8

Composite action between walls and other elements

8.1 COMPOSITE WALL-BEAMS

8.1.1 Introduction

If a wall and the beam on which it is supported can be considered to act as a single composite unit then, for design purposes, the proportion of the load acting on the wall which is carried by the supporting beam must be determined. Prior to 1952 it was common practice to design the beams or lintels so as to be capable of carrying a triangular load of masonry in which the span of the beam represented the base of an equilateral triangle. The method allowed for a proportion of the self-weight of the masonry but ignored any additional superimposed load.

Since that period a great deal of research, both practical and theoretical, has been undertaken, and a better understanding of the problem is now possible.

Consider the simply supported wall-beam shown in Fig. 8.1. The action of the load introduces tensile forces in the beam due to the bending of the deep composite wall-beam and, since the beam now acts as a tie, the supports are partially restrained horizontally so that an arching action results in the panels. The degree of arching is dependent on the relative stiffness of the wall to the beam, and it will be shown later that both the flexural stiffness and the axial stiffness must be taken into account. In general, the stiffer the beam the greater the beam-bending moment since a larger proportion of the load will be transmitted to the beam.

The values of the vertical and horizontal stresses depend on a number of factors, but typical plots of the vertical and horizontal stress distributions along XX and YY of Fig. 8.1 are shown in Fig. 8.2.

Note that the maximum vertical stress, along the wall-beam interface, occurs at the supports and that at mid-span the horizontal