The plan area of the 4 m long wall is $4 \times 0.215 = 0.86\,m^2$. This is greater than $0.2\,m^2$, and therefore the plan area reduction factor does not apply.

The expression for the vertical design strength per unit length of walls is $\beta t f_k/\gamma_m$. Therefore

$$383.58 = \frac{\beta t f_k}{\gamma_m}$$

from which

$$f_k \text{ required} = \frac{383.58\gamma_m}{\beta t} = \frac{383.58 \times 2.8}{0.93 \times 215} = 5.37\,\text{N/mm}^2$$

By reference to Table 4.5a:

Use $20\,\text{N/mm}^2$ bricks in grade (iii) mortar ($f_k = 5.8\,\text{N/mm}^2$).

Example 4.4

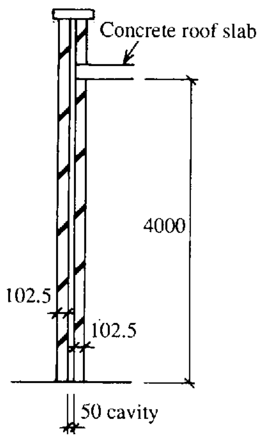

Figure 4.25 *Section through wall*

The brick cavity wall shown in Figure 4.25 supports an ultimate load on the inner leaf of 75 kN/m, the outer leaf being unloaded. Select suitable bricks and mortar if both the manufacturing and construction control are to be normal.

The effective height $h_{ef} = 0.75h = 0.75 \times 4000 = 3000$ mm. The effective thickness t_{ef} is the greatest of $2(t_1 + t_2)/3 = 2(102.5 + 102.5)/3 = 136.7$ mm, or $t_1 = 102.5$ mm, or $t_2 = 102.5$ mm. Thus the slenderness ratio is given by

$$\text{SR} = \frac{h_{ef}}{t_{ef}} = \frac{3000}{136.7} = 21.95 < 27$$

This is satisfactory. The load from the roof slab will be applied eccentrically as shown in Figure 4.26; that is, the eccentricity is given by

$$e_x = \frac{t}{2} - \frac{t}{3} = \frac{t}{6} = 0.167t$$

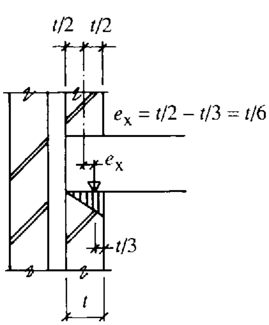

Figure 4.26 *Load eccentricity*

Hence from Table 4.8 the capacity reduction factor β is 0.473.

The vertical design strength per unit length of wall is $\beta t f_k/\gamma_m$. Therefore

$$75\,\text{N/mm} = \frac{\beta t f_k \times 1.15}{\gamma_m}$$

from which

$$f_k \text{ required} = \frac{75\gamma_m}{\beta t \times 1.15} = \frac{75 \times 3.5}{0.473 \times 102.5 \times 1.15} = 4.7\,\text{N/mm}^2$$

By reference to Table 4.5a:

Use $15\,\text{N/mm}^2$ bricks in grade (iii) mortar ($f_k = 5\,\text{N/mm}^2$).

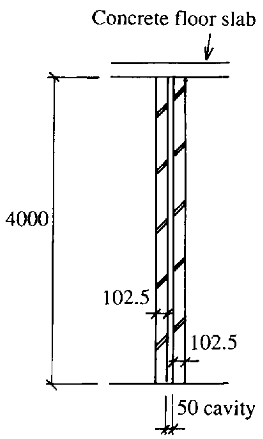

Figure 4.27 *Section through wall*

Example 4.5

The brick cavity wall shown in Figure 4.27 supports an ultimate axial load of 150 kN/m shared equally by both leaves. Select suitable bricks and mortar if both the manufacturing and construction control are to be normal.

The effective height and thickness and hence the slenderness ratio are the same as in Example 4.4; that is, SR = 21.95. However in this example, since the two leaves of the wall share the load equally, there is no eccentricity. Hence from Table 4.8 the capacity reduction factor β is 0.62.

The vertical design strength is $\beta t f_k/\gamma_m$. Thus, for each leaf,

$$f_k \text{ required} = \frac{150\gamma_m}{\beta t} = \frac{150 \times 3.5}{0.62 \times 2 \times 102.5} = 4.13\,\text{N/mm}^2$$

It should be noted that the narrow brick wall factor of 1.15 does not apply in this instance since both leaves are loaded. From Table 4.5a:

Use 15 N/mm^2 bricks in grade (iv) mortar ($f_k = 4.4\,\text{N/mm}^2$).

Example 4.6

The wall shown in Figure 4.28 is built of 50 N/mm^2 clay bricks set in grade (i) mortar. Calculate the vertical design strength of the wall if it is 2.4 m high and is provided with simple lateral support at the top. The category of manufacturing control is to be normal and that for construction special.

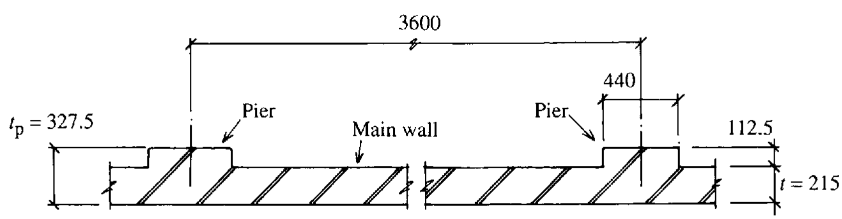

Figure 4.28 *Plan on wall*

The effective height with simple lateral resistance is $h_{ef} = h = 2400$ mm. Since vertical lateral support is not provided, the effective height will govern the slenderness. The effective thickness will be influenced by the piers:

$$\frac{\text{Pier spacing}}{\text{Pier width}} = \frac{3600}{440} = 8.18$$

$$\frac{\text{Pier thickness}}{\text{Wall thickness}} = \frac{t_p}{t} = \frac{327.5}{215} = 1.52$$

Therefore, by interpolation from Table 4.7, the stiffness coefficient $K = 1.151$. Hence the effective thickness $t_{ef} = tK = 215 \times 1.151 = 247.47$ mm. Thus the slenderness ratio is given by

$$SR = \frac{h_{ef}}{t_{ef}} = \frac{2400}{247.47} = 9.7 < 27$$