Modification factors for f_k

- Horizontal cross-sectional area=4.25×0.1025=0.44m^2. This is greater than 0.2m^2. Therefore no modification factor for area.
- Narrow masonry wall. Wall is one brick thick; modification factor=1.15.

Required value of f_k

$$f_k = 2.48/1.15 = 2.16\,\mathrm{N/mm^2}$$

Selection of brick/mortar combination
Use Fig. 4.1 to select a suitable brick/mortar combination-nominal in this case.

(b) Using ENV 1996–1–1

The dimensions, loadings and safety factors used here are the same as those given above in section (a). The reinforced concrete floor slabs are assumed to be of the same thickness as the walls (102.5 mm) and the modular ratio E_{slab}/E_{wall} is taken as 2.

Loading
As for section (a).

Safety factors

$$\gamma_m = 3.0$$

$$\gamma_f(\mathrm{DL}) = 1.35$$

$$\gamma_f(\mathrm{LL}) = 1.5$$

Design vertical loading (Fig. 5.18)

Load from above=1.35×21.1+1.5×2.2=31.785kN/m
Self-weight of wall=1.35×17=22.95kN/m
Total vertical design load W_1=54.735kN/m
Load from slab W_2=1.35×4.1+1.5×2.2=8.835 kN/m

Eccentricity
Equation (5.8) can be rewritten:

$$M_1 = \frac{4E_wI_w/h}{8E_wI_w/h + 4E_cI_c/L_2}\left(\frac{w_2L_2^2}{12}\right)$$

or

$$M_1 = \frac{1}{2 + (E_c I_c h / E_w I_w L_2)} \left(\frac{w_2 L_2^2}{12} \right)$$

Taking $E_c/E_w = 2$, $I_c/I_w = 1$, $h = 2650\,\text{mm}$ and the clear span L_2= 2797.5mm

$$M_1 = \frac{1(2.8^2 \times 8.835/12)}{2 + (2 \times 1 \times 0.947)} = \frac{5.77}{3.894} = 1.48\,\text{kN m}$$

As shown in section (a)

$$N_1 = 31.785 + 8.835 + 22.95 = 63.57\,\text{kN}$$

$$M_1/N_1 = 1.48/63.57 = 0.023\,\text{m}$$

Taking e_{hi}=0 and e_a=h_{ef}/450=1.988/450=0.004m equation (5.4) becomes

$$e_i = 0.023 + 0 + 0.004 = 0.027 \quad (\geqslant 0.05t = 0.005)$$

The design vertical stress at the junction is 31.785/102.5 and since this is greater than 0.25 N/mm^2 the code allows the eccentricity to be reduced by (1-k/4) where k is given by equation 5.9.

For this example

$$k = E_c I_c h/2E_w I_w L_2 = 2 \times 1 \times 0.947/2 = 0.947$$

and the factor

$$(1 - k/4) = (1 - 0.24) = 0.76$$

so that the eccentricity can be reduced to

$$e_i = 0.023 \times 0.76 + 0 + 0.004 = 0.0215$$

and

$$\Phi_i = 1 - 2 \times 0.0215/0.1025 = 0.58$$

Slenderness ratio
Effective height=0.75×2650=1988 mm
Effective thickness=$(102.53+102.53)^{1/3}$=129 mm
Slenderness ratio=1988/129=15.4