

The critical load combination which produces the severe condition is (12.37) and the design load therefore is $(1.97 \times 102.5 \times 10^3)/10^3 = 202 \text{ kN/m}$.

(f) *First floor*

(i) Dead and imposed loads

$$\begin{aligned} \text{dead} + \text{imposed} &= 1.4 G_k + 1.6 Q_k \\ &= 1.4 \times 143.40 + 1.6 \times 19.44 \\ &= 200.76 + 31.10 = 231.86 \text{ kN/m} \end{aligned} \quad (12.41)$$

$$\begin{aligned} \text{stress} &= (200.76 \times 10^3)/(102.5 \times 10^3) + (31.10 \times 10^3)/(102.5 \times 10^3) \\ &= 1.96 + 0.30 = 2.26 \text{ N/mm}^2 \end{aligned} \quad (12.42)$$

(ii) Dead and wind loads

● Windward side

$$\text{dead} + \text{wind} = 0.9 G_k + 1.4 W_k \quad (12.43)$$

$$\begin{aligned} \text{stress} &= (1.96 \times 0.9)/1.4 - 1.4 \times 0.365 \\ &= 1.26 - 0.51 = 0.75 \text{ N/mm}^2 \text{ (no tension)} \end{aligned} \quad (12.44)$$

● Leeward side

$$\text{dead} + \text{wind} = 1.4 G_k + 1.4 W_k \quad (12.45)$$

$$\text{stress} = 1.96 + 0.51 = 2.47 \text{ N/mm}^2 \quad (12.46)$$

(iii) Dead, imposed and wind loads

$$\text{dead} + \text{imposed} + \text{wind} = 1.2 G_k + 1.2 Q_k + 1.2 W_k \quad (12.47)$$

$$\begin{aligned} \text{stress} &= (1.2 \times 1.96)/1.4 + (1.2 \times 0.3)/1.6 \pm (1.2 \times 0.51)/1.4 \\ &= 1.68 + 0.225 \pm 0.437 \\ &= 2.34 \text{ or } 1.47 \text{ N/mm}^2 \text{ (no tension develops)} \end{aligned} \quad (12.48)$$

The critical load combination is (12.45) and the design load for this floor is $(2.47 \times 102.5 \times 10^3)/10^3 = 253.18 \text{ kN/m}$.

(g) *Ground floor*

(i) Dead and imposed loads

$$\text{dead} + \text{imposed} = 1.4 G_k + 1.6 Q_k \quad (12.49)$$

$$\begin{aligned} \text{stress} &= (1.4 \times 168.08)/102.5 + (1.6 \times 22.68)/102.5 \\ &= 2.3 + 0.354 = 2.654 \text{ N/mm}^2 \end{aligned} \quad (12.50)$$

(ii) Dead and wind loads

● Windward side

$$\text{dead} + \text{wind} = 0.9 G_k + 1.4 W_k \quad (12.51)$$

$$\text{stress} = (2.3 \times 0.9)/1.4 - 1.4 \times 0.496$$

(proportionally reduced from (12.50))

$$= 1.48 - 0.69 = 0.78 \text{ N/mm}^2 \quad (\text{no tension}) \quad (12.52)$$

● Leeward side

$$\text{dead} + \text{wind} = 1.4 G_k + 1.4 W_k \quad (12.53)$$

$$\text{stress} = 2.3 + 0.69 = 2.99 \text{ N/mm}^2 \quad (12.54)$$

(iii) Dead, imposed and wind loads

$$\text{dead} + \text{imposed} + \text{wind} = 1.2 G_k + 1.2 Q_k + 1.2 W_k \quad (12.55)$$

$$\text{stress} = (2.3 \times 1.2)/1.4 + (1.2 \times 0.354)/1.6 \pm 1.2 \times 0.496$$

$$= 1.97 + 0.266 \pm 0.595$$

$$= 2.83 \text{ or } 1.64 \text{ N/mm}^2 \quad (\text{no tension develops}) \quad (12.56)$$

The load combination (12.53) produces the severe condition and hence the design load is $(2.99 \times 102.5 \times 10^3)/10^3 = 306.48 \text{ kN/m}$.

Note that from section 12.5.2 the total wind force

$$\begin{aligned} F &= C_f q A_c \\ &= (1.1 \times 1269)/10^3 \times 21 \times 21 \\ &= 615.6 \text{ kN} \end{aligned}$$

and

$$615.6 \times \gamma_f > 0.015 G_k \quad (G_k \text{ from section 12.4.3})$$

or

$$615.6 \times 1.4 = 861.84 \text{ kN} > 0.015 \times 17643 = 264.65 \text{ kN}$$

Hence in the load combination $0.015 G_k$ has not been considered. This is true for all other floors also.

12.6.2 Selection of brick and mortar combinations for wall A:BS 5628

Design vertical load resistance of wall is $(\beta t f_k)/g_m$ (clause 32.2.1), eccentricity $e = 0$, $SR = \frac{3}{4} \times (2.85 \times 10^3)/102.5 = 20.85$. Hence $\beta = 0.67$