BM at centre of the panel=627.8×(Cp_e+CP_i)h^2×0.104×1.4

=627.8×(1.1+0.2)×$(2.85)^2$×0.104×1.4

=964.6Nm/m (Cp_e and Cp_i from CP3, Chapter V: Part 2)

(BM coefficient for four-sided simply supported panel is 0.104; table 3.1, BS 8110)

$$\text{BM/leaf} = 964.6/2 = 482.3\,\text{Nm/m}$$

(since both leaves are of same stiffness)

$$e_{\text{centre}} = (482.3 \times 10^3)/(94.66 \times 10^3) = 5.1\,\text{mm}$$

where

$$P + P_1 = 94.66\,\text{kN/m}$$

Resultant

$$e_{cc} = (2.22/2) + 5.1 = 6.21\,\text{mm} = 0.06t$$

(b) Wind blowing west-east direction

The panel B is not only subjected to dead and imposed loads, but also subjected to wind loading from west to east direction. Then

$$\text{BM at the centre} = 0.104 \times q\,h^2 \times \gamma_f \quad (q \text{ from section 12.5.2})$$

$$= 0.104 \times 1.4 \times 1269 \times 1.1 \times (2.85)^2$$

(considering the loading from overall stability)

$$= 1650.84\,\text{Nm/m}$$

$$\text{BM/leaf (as before)} = 1650.85/2 = 825.42\,\text{Nm/m}$$

$$e_{cc} \text{ at the centre} = (825.42 \times 10^3)/(94.66 \times 10^3) = 8.72\,\text{mm}$$

Therefore resultant

$$e = 8.72 - (2.22/2)$$

$$= 7.61\,\text{mm} = 0.074t$$

(the bending moment induced due to wind loading acts against those due to the vertical load).

Since resultant eccentricity of case (b) is greater than case (a), case (b) eccentricity is considered in the design.

12.6.6 Calculation of characteristic compressive stress f_k for wall B (inner leaf)

$$\text{design load} = (\beta t f_k)/\gamma_m \quad \text{(clause 32.2.1, BS 5628)}$$

$$\text{slenderness ratio} = (\tfrac{3}{4} \times 2.85 \times 10^3)/[\ \tfrac{2}{3}(102.5 + 102.5)] = 15.6$$

and

$$e_R = 0.074t$$

Therefore

$$\beta \text{ (from table 7)} = 0.81 \text{ from linear interpolation.}$$

Therefore

$$0.81 \times 102.5 f_k = 3.5 \times 201$$

$$f_k = 8.47\,\text{N/mm}^2$$

Use $20\,\text{N/mm}^2$ brick in 1:$\frac{1}{4}$:3 mortar,

$$f_k = 7.4 \times 1.15 = 8.51\,\text{N/mm}^2 > 8.47\,\text{N/mm}^2 \quad \text{(safe)},$$

Check for shear:

$$\text{design characteristic shear stress} = \gamma_{mv} \times \frac{\text{shear force}}{\text{area}} \gamma_f$$

$$= \frac{2.5 \times 37.9 \times 10^3}{2 \times 102.5 \times 4250} \times 1.4 = 0.15\,\text{N/mm}^2$$

$$< 0.35 + \frac{0.9 \times 91.90 \times 10^3 \times 0.6}{1000 \times 102.5}$$

$$= 0.834\,\text{N/mm}^2 \quad \text{(safe)},$$

12.6.7 Design of the outer leaf of the cavity wall B in GF

Load combination:

- Windward side

$$\text{dead} + \text{imposed} = 0.9\,G_k + 1.2\,W_k \quad \text{(300 mm projection of roof)}$$

Note: $\gamma_f = 1.2$ is used as per clause 22.

$$\text{stress} = \frac{0.9\,(7 \times 7.26 + 0.30 \times 3.5)\,10^3}{102.5 \times 1000} - 1.2 \times 0.498$$

$$= 0.455 - 0.598 = -0.14\,\text{N/mm}^2$$