Eccentricity
Because of the symmetry equation (5.8) can be rewritten:

$$M_1 = \frac{4\,E_w\,I_w/h}{8\,E_w I_w/h + 8\,E_c I_c/L_3}\left(\frac{w_3\,L_3^2}{12} - \frac{w_2 L_2^2}{12}\right)$$

or

$$M_1 = \frac{1}{2 + 2(E_c I_c h/E_w I_w L_3)}\left(\frac{L_3^2}{12}(w_3 - w_2)\right)$$

Taking E_c/E_w=2, I_c/I_w=1, h=2650 mm and the clear span L_3=2797.5 mm

$$M_1 = \frac{1[2.8^2 \times (8.835 - 5.535)/12]}{2 + (2 \times 2 \times 1 \times 0.947)} = \frac{2.156}{5.788} = 0.372\,\text{kN m}$$

$$N_1 = 8.835 + 5.535 + 170.25 + (1.35 \times 17) = 207.57\,\text{kN}$$

$$M_1/N_1 = 0.372/207.57 = 0.0018\,\text{m}$$

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

$$e_i = 0.0018 + 0 + 0.004 = 0.0058 \quad (\geqslant 0.05t = 0.005)$$

The design vertical stress at the junction is 207.57/102.5 and since this is greater than 0.25 N/mm² the code allows the eccentricity to be reduced by (1-k/4) where k is given by equation (5.9).

For this example

$$k = E_c I_c h/E_w I_w L_3 = 2 \times 1 \times 0.947 = 1.894$$

and the factor

$$(1 - k/4) = (1 - 0.4735) = 0.5265$$

so that the eccentricity can be reduced to 0.0049 and

$$\Phi_i = 1 - 2 \times 0.0049/0.1025 = 0.90$$

Slenderness ratio
As for section (a).

Design vertical load resistance
In this section the value of Φ_i=0.90 must replace the value of β=0.78 used in section (a) and γ_m=3.0, resulting in a value of 30.87 f_k for the design vertical load resistance.

Determination of f_k
As for section (a)

$$30.87 f_k = 8.835 + 8.835 + 170.25 + (1.35 \times 17)$$
$$= 210.87\,\text{kN}$$
$$f_k = 6.83\,\text{N/mm}^2$$

Modification factors for f_k

There are no modification factors since the cross-sectional area of the wall is greater than 0.1m^2 and the Eurocode does not include a modification factor for narrow walls.

Required value of f_k

f_k=6.83N/mm2 (compared with 8.35 in section (a))

Note that in ENV 1996–1–1 an additional assumption is required for the calculation in that the modular ratio is used. This ratio is not used in BS 5628. It can be shown that for this symmetrical case the value assumed for the ratio does not have a great influence on the final value obtained for f_k. In fact for the present example taking E_{slab}/E_{wall}=1 would result in f_k=7.0N/mm^2 whilst taking E_{slab}/E_{wall}=4 would result in f_k=6.7N/mm^2.

Selection of brick/mortar combination
This selection can be achieved using the formula given in section 4.4.3.(b) Using the previously calculated value of f_k and an appropriate value for f_m, the compressive strength of the mortar, the formula can be used to find f_b, the normalized unit compressive strength. This value can then be corrected using δ, from Table 4.6, to allow for the height/width ratio of the unit used.

5.9.2 Example 2: External cavity wall (Fig. 5.17)

(a) Using BS 5628

Loads on inner leaf

	DL (kN/m)	*IL* (kN/m)
Load from above	21.1	2.2
Self-weight of wall	17.0	–
Load from slab	4.1	2.2